ENCYCLOPÆDIA BRITANNICA.

Le Clerc invenit.

A. Bell Prin. Wal. Sculptor auxit et excu

ENCYCLOPÆDIA BRITANNICA;

OR, A

DICTIONARY

OF

ARTS, SCIENCES,

AND

MISCELLANEOUS LITERATURE;

Conftructed on a PLAN,

BY WHICH

THE DIFFERENT SCIENCES AND ARTS
Are digefted into the FORM of Diftinct

TREATISES OR SYSTEMS,

COMPREHENDING

The HISTORY, THEORY, and PRACTICE, of each,
according to the Lateft Difcoveries and Improvements;

AND FULL EXPLANATIONS GIVEN OF THE

VARIOUS DETACHED PARTS OF KNOWLEDGE,

WHETHER RELATING TO

NATURAL and ARTIFICIAL Objects, or to Matters ECCLESIASTICAL,
CIVIL, MILITARY, COMMERCIAL, *&c.*

Including ELUCIDATIONS of the moft important Topics relative to RELIGION, MORALS,
MANNERS, and the OECONOMY of LIFE:

TOGETHER WITH

A DESCRIPTION of all the Countries, Cities, principal Mountains, Seas, Rivers, *&c.*
throughout the WORLD;

A General HISTORY, *Ancient* and *Modern*, of the different Empires, Kingdoms, and States;

AND

An Account of the LIVES of the moft Eminent Perfons in every Nation,
from the earlieft ages down to the prefent times.

Compiled from the writings of the beft Authors, in feveral languages; the moft approved Dictionaries, as well of general fcience as of its particular branches; the Tranfactions, Journals, and Memoirs, of Learned Societies, both at home and abroad; the MS. Lectures of Eminent Profeffors on different fciences; and a variety of Original Materials, furnifhed by an Extenfive Correfpondence.

THE THIRD EDITION, IN EIGHTEEN VOLUMES, GREATLY IMPROVED.

ILLUSTRATED WITH FIVE HUNDRED AND FORTY-TWO COPPERPLATES.

VOL. I.

INDOCTI DISCANT, ET AMENT MEMINISSE PERITI.

EDINBURGH,
PRINTED FOR A. BELL AND C. MACFARQUHAR.
MDCCXCVII.

Entered in Stationers Hall in Terms of the Act of Parliament.

TO THE

KING.

SIR,

WHEN the Proprietors of the ENCYCLOPÆDIA BRITANNICA reſolved to publiſh a new and improved Edition of that Work, they naturally requeſted permiſſion to lay it at the feet of their SOVEREIGN.

YOUR MAJESTY's gracious compliance with that requeſt, whilſt it incited them to employ their utmoſt efforts to make this Edition not altogether unworthy of Your Royal Protection, procured for their undertaking the favour of that Public by which Your MAJESTY is revered as the Father of Your People, and the enlightened Patron of Arts, Sciences, and Literature.

THAT

That by the Wisdom of Your Councils, and the Vigour of Your Fleets and Armies, Your Majesty may be enabled soon to restore Peace to Europe; that You may again have leisure to extend Your Royal Care to the Improvement of Arts, and the Advancement of Knowledge; that You may Reign long over a Free, a Happy, and a Loyal People; and that the Sceptre of the British Empire may be swayed by Your Majesty's Descendants to the latest Posterity, is the earnest prayer of

YOUR MAJESTY's

Most dutiful Subjects,

And devoted Servants,

Andrew Bell

and

Colin Macfarquhar.

Edinburgh, 1797.

PREFACE.

THE utility of ſcience, and the delight which it affords to the human mind, are acknowledged by every man who is not immerſed in the groſſeſt ignorance. It is to the philoſopher that the huſbandman, the architect, the carpenter, and the ſeaman, &c. are indebted for the principles of thoſe arts, by which they furniſh us with moſt of the accommodations, and with all the elegances, of civilized life; whilſt the pleaſure experienced in the very progreſs of philoſophical reſearch is ſuch, as both reaſon and revelation intimate, not obſcurely, will conſtitute part of our happineſs in a future ſtate.

SMALL, however, would be the attainments of any man in ſcience, were they confined within the limits of his own reſearches. Our knowledge of corporeal nature originates in thoſe perceptions which we have by the organs of ſenſe; and which, treaſured up in the memory, we can, by the powers of reaſon and imagination, variouſly modify, arrange, and combine, ſo as from a number of particular truths to form to ourſelves general principles. But theſe principles would be few indeed, had each individual no other materials of which to form them than the perceptions furniſhed immediately by his own ſenſes. It has long been a matter of general regret, that the progreſs of ſcience has been ſlow and laborious; but it never could have commenced, or could have only commenced, were every man obliged to begin his career from his own ſenſations, without availing himſelf of the diſcoveries of others who have travelled over the ſame ground before him.

To this narrow field, however, philoſophical inveſtigation is not confined. By means of the arts of writing and drawing, the diſcoveries of one individual may be made acceſſible to another, and the ſcience of every age and of every country treaſured up for the uſe of ages and countries the moſt remote. Hence ariſes the utility of what is generally called *literature*, or the knowledge of the languages, cuſtoms, and manners, which have prevailed among the various nations of the earth. Without this knowledge the ſcience of the ancients would be locked up from the moderns; and even the diſcoveries of modern nations would be inacceſſible to each other.

WITH all the aid which can be furniſhed by one age or nation to another, the labours of the philoſopher ſtill preſent themſelves as immenſe and difficult. His object comprehends univerſal nature, of which nothing can be known but by ſenſation and reflection; but the objects of ſenſe are all individuals, almoſt infinite in number, and for ever changing: ſo that inſtead of a ſyſtem of ſcience, the firſt view of the corporeal world would lead us to imagine, that from our moſt diligent reſearches nothing could be obtained but a vaſt collection of particular truths. Such a collection, whilſt it would burden the memory, could be of little advantage to the arts of life; for we are very ſeldom brought, on different occaſions, into circumſtances ſo perfectly ſimilar, as to require, without the ſmalleſt variation, the ſame conduct.

BUT

But though all the objects of ſenſe, of memory, and of conſciouſneſs, are unqueſtionably individuals diſtinct from each other, the contemplative mind of man obſerves among them various reſemblances and analogies. It obſerves, that the ſenſation communicated to the ſight by ſnow is ſimilar to that communicated by milk, paper, chalk, and a thouſand other objects; that all external objects are ſolid, extended, diviſible, and of ſome figure; that the path deſcribed by a planet round the ſun reſembles that deſcribed by a cannon ball over the ſurface of the earth; and that many of the actions of brutes are ſimilar to thoſe which we are impelled to perform by the internal feelings of deſire and averſion.

This view of nature, quieſcent and active, ſuggeſted to the philoſopher the expediency of ſtudying the vaſt multitude of objects which compoſe the univerſe; not individually, but in groups claſſed together according to their perceived reſemblances or analogies. He ſaw that his labour would thus be at once ſhortened and rendered infinitely more uſeful; but he likewiſe ſaw, or ought to have ſeen, that it would by no means be taken wholly away. Much cautious attention is requiſite to claſs objects in human ſyſtems as they are in fact claſſed in the ſyſtem of nature. Analogies are apt to be miſtaken for reſemblances; a reſemblance in a few particulars for a reſemblance in all; and events, which have in reality very little in common, to be attributed to the ſame or to ſimilar cauſes. Theſe miſtakes can be avoided only by a painful induction of facts, by means of experiments accurately made on individual objects; and it was but very lately that induction was employed as the inſtrument of ſcientific reſearch.

In ancient Greece, where philoſophy firſt aſſumed a ſyſtematic form, all the objects of human thought were ranged under ten categories or predicaments; and every thing which could be affirmed or denied of theſe categories was ſuppoſed to be comprehended under five claſſes called predicables. Among the Greek philoſophers, therefore, the uſe of induction was to aſcertain the category to which any particular object belonged; after which, nothing more was to be done but, by a ſhort proceſs of ſyllogiſtic reaſoning, to affirm or deny of that object whatever could be affirmed or denied of its category.

To this ancient arrangement of human knowledge many inſuperable objections have been urged. But it muſt be confeſſed, that the arrangements which have been propoſed in its ſtead, by the ſages of modern times, have little claim to greater perfection. Locke claſſed all things under three categories; substances, modes, and ideas. Hume reduced the number to two; impressions and ideas. The former of theſe philoſophers admitted of only four predicables, all different from thoſe of the ancients; the latter at firſt extended the number to ſeven, but afterwards reduced it to three; among which none of the ancient predicables are to be found, and only one of thoſe which had been admitted by Locke.

These different claſſifications of knowledge are the natural conſequences of mens attempting what the greateſt powers of the human intellect will never be able to accompliſh. It certainly was the aim of Ariſtotle, or whoever was the inventor of the categories and the predicables, to delineate the whole region of human knowledge, actual and poſſible; to point out the limits of every diſtrict; and to aſſign to every thing which can be the object of human thought its proper place in the vaſt arrangement. Such an attempt evinces the ambition of its author: nor has the ambition been much leſs of ſome of thoſe by whom the raſh arrogance of the Stagyrite has been moſt ſeverely cenſured. Locke ſays expreſsly, that as the objects of our knowledge are confined to *ſubſtances*, *modes*, and *ideas*, ſo we can diſcover nothing of theſe, but, *1ſt*, their *identity* or *diverſity*; *2d*, their *relation*; *3d*, their *co-exiſtence* or *neceſſary connection*; and, *4th*, their *real exiſtence*: while Hume declares, with ſome heſitation indeed, that we can know nothing but the *reſemblance*, *contiguity* in time or place, and *cauſation* of our impreſſions and ideas.

These

These attempts, as well modern as ancient, to contract the whole furniture of the human mind into the compafs of a nut-fhell, and to give at once a complete chart of knowledge, have been cenfured, not only as prefumptuous, but as the fertile fources of error, by a philofopher whofe writings do honour to this age and nation. "To make a perfect divifion (fays Dr Reid), a man muft have a perfect comprehenfion of the whole fubject at one view. When our knowledge of the fubject is imperfect, any divifion we can make muft be like the firft fketch of a painter, to be extended, contracted, or mended, as the fubject fhall be found to require. Yet nothing is more common, not only among the ancient but even among modern philofophers, than to draw from their incomplete divifions, conclufions which fuppofe them to be perfect. A divifion is a repofitory which the philofopher frames for holding his ware in convenient order. The philofopher maintains, that fuch or fuch a thing is not good ware, becaufe there is no place in his ware-room that fits it. We are apt to yield to this argument in philofophy, but it would appear ridiculous in any other traffic."

The truth of thefe obfervations will be controverted by no man who is not an abfolute ftranger to the various fyftems, ancient and modern, of what has been called *the firft philofophy*.

But if every fcientific arrangement of knowledge which has hitherto been propofed be fo very imperfect, what judgment are we to form of that which is adopted by the compilers of Dictionaries or Encyclopædias, in which the arts and fciences are arranged according to the order of the alphabet, and A, B, C, &c. confidered as the categories? The author whom we have juft quoted affirms, that of all methods of arrangement this is the moft antiphilofophical; and if he allude only to fuch Encyclopædias as are mere dictionaries, in which the feveral arts and fciences are broken into fragments, fcattered through the work according as the alphabet has happened to difpofe of the various technical terms which have place in each, his affertion is unqueftionably true. Its truth is indeed admitted by Chambers himfelf, the compiler of one of the firft and moft valuable of thefe dictionaries, who fpeaks of the works of his predeceffors as containing nothing but a multitude of materials, or a confufed heap of incoherent parts. "Former lexicographers (fays he) fcarce attempted any thing like ftructure in their works; they feem not to have been aware that a dictionary is in fome meafure capable of the advantages of a continued difcourfe: and hence it is, that we fee nothing like a whole in what they have done."

Proposing to remedy this defect in his own Dictionary of Arts and Sciences, he informs us, that "his view was to confider the feveral matters, not only in themfelves, but relatively, or as they refpect each other; both to treat them as fo many wholes, and as fo many parts of fome greater whole; and to point out their connection with each other, and with that whole, by reference: fo that by a courfe of references from generals to particulars, from premifes to conclufions, from caufe to effect, and *vice verfa*, a communication might be opened between the feveral parts of the work, and the detached articles be in fome meafure replaced in the natural order of fcience, out of which the alphabetical order had removed them." To enable the reader with the greater eafe to replace in the order of fcience the various articles fcattered through the dictionary, he furnifhed him in the preface with what muft be confidered as an elegant analyfis of human knowledge; by which may be feen, at one view, the mutual dependence of the feveral parts upon each other, and the intimate connection of the whole.

But though the found judgment of Mr Chambers thus directed him to make the arrangement of his Cyclopædia vaftly preferable to that of any work of the fame kind which had been publifhed before it; we are afraid that, in its original form, it was ftill liable to the objections of Dr Reid. Had all the articles in the work been treated in fufficient detail to conftitute, when reunited in the order of fcience, fo many complete fyftems; yet the multitude of references was fo great, that this reunion could not have been made but by a degree of irkfome labour, to which few readers will ever fubmit.

mit (A). The work therefore, with all its improvements, was ſtill a book of ſhreds and patches, rather than a ſcientific dictionary of arts and ſciences; and conſidering the letters of the alphabet as the categories, the arrangement was certainly inconvenient as well as antiphiloſophical.

Of this inconveniency, inſeparable from a mere *dictionary* of arts and ſciences, the original Compilers of the Encyclopædia Britannica were fully aware; and they reſolved to conſtruct their own Work upon a plan from which it might be completely removed. They were equally appriſed with their predeceſſors of the utility of explaining by itſelf every technical term, and of illuſtrating every particular topic, in the wide circle of the arts and ſciences; but they were at the ſame time ſenſible, that it is only by thinking in method, and reducing their ideas to the order of nature, that mankind can make

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(A) To be convinced of the truth of this aſſertion, one needs but to caſt his eye over the author's table of arrangement. It is as follows.

KNOWLEDGE is either

- *Natural* and *Scientifical*; which is either —
  - *Senſible*; conſiſting in the perception of phenomena or external objects—called PHYSIOLOGY or NATURAL HISTORY; and which, according to the different kinds of ſuch objects, divides into —
    - METEOROLOGY.
    - HYDROLOGY.
    - MINERALOGY.
    - PHYTOLOGY.
    - ZOOLOGY.
  - OR,
  - *Rational*; conſiſting in the perception of the intrinſic characters or habitudes of ſenſible objects — either their —— ——
    - *Powers*, and *Properties*—called PHYSICS, and NATURAL PHILOSOPHY.
    - *Abſtracts*—called METAPHYSICS, which ſubdivides into
      - ONTOLOGY.
      - PNEUMATOLOGY.
    - *Quantities*—called PURE MATHEMATICS—which divides, according to the ſubject of the quantity, into —
      - ARITHMETIC—whence
        - ANALYTICS.
        - ALGEBRA.
      - GEOMETRY—whence / STATICS ——
        - TRIGONOMETRY.
        - CONICS.
        - SPHERICS.
    - *Relations* to our happineſs—called RELIGION, or the doctrine of OFFICES, which ſubdivides into
      - ETHICS, or NATURAL RELIGION—whence
        - POLITICS.
        - LAW.
      - THEOLOGY, or REVELATION.
- OR,
- *Artificial* and *Technical*, (conſiſting in the application of natural notices to farther purpoſes), which is either —
  - *Internal*; employed in diſcovering their agreement and diſagreement; or their relations in reſpect of truth—called LOGICS.
  - OR,
  - *External*; which is either
    - *Real*, employed in diſcovering and applying the
      - *Latent powers* and *properties* of bodies—called CHEMISTRY—whence
        - ALCHEMY.
        - NATURAL MAGIC, &c
      - *Quantities* of bodies—called MIXED MATHEMATICS; which, according to the different ſubjects, reſolves into ——
        - OPTICS, CATOPTRICS, DIOPTRICS, — whence
          - PERSPECTIVE.
          - PAINTING.
        - PHONICS—whence MUSIC.
        - HYDROSTATICS, HYDRAULICS.
        - PNEUMATICS.
        - MECHANICS—whence
          - ARCHITECTURE.
          - SCULPTURE.
          - TRADES and MANUFACTURES.
        - PYROTECHNIA—whence
          - The MILITARY *Art*.
          - FORTIFICATION.
        - ASTRONOMY—whence
          - CHRONOLOGY.
          - DIALLING.
        - GEOGRAPHY, HYDROGRAPHY—whence
          - NAVIGATION.
          - COMMERCE.
      - *Structure* and *economy* of organical bodies, called ANATOMY.
      - *Relations* thereof to the preſervation and improvement—either of —
        - Animals——called
          - MEDICINE.
          - PHARMACY.
        - Vegetables—— called
          - AGRICULTURE.
          - GARDENING.
        - BRUTES——called
          - FARRYING.
          - MANEGE—whence
            - HUNTING.
            - FALCONRY.
            - FISHING, &c.
    - OR,
    - *Symbolical*, employed in framing and applying
      - *Words*, or articulate ſigns of ideas—called GRAMMAR.
      - *Armories*—called HERALDRY.
      - *Tropes* and *Figures*—called RHETORIC.
      - *Fables*—called POETRY.

Such

make any progrefs in ufeful knowledge. To accomplifh therefore effectually what Mr Chambers by means of his prefatory fcientifical analyfis attempted in vain, they endeavoured to give a compendious, yet clear and fatisfactory, account of the feveral arts and fciences under their proper denominations, whilft the fubordinate articles in each were likewife explained under their technical terms. Thefe fubordinate articles they divided into three kinds; of which the firft confifts of fuch as, independent of particular fyftems, admit of a full and complete illuftration under their proper names; the fecond, of fuch as require to be partly difcuffed under the fyftems to which they belong, and partly under their own denominations; and the third, of fuch as appertain to fyftems of which all the parts muft be elucidated together. Articles of the firft kind admit of no references; thofe of the fecond, being only partially explained under their proper denominations, demand references to the fyftems where the illuftrations are completed; and thofe of the laft are wholly referred to the fyftems of which they are conftituents.

Such has been the arrangement of the Arts and Sciences in every edition of the Encyclopædia Britannica; and it furely falls not under that cenfure which Dr Rei. pronounced with juftice on many other works bearing a fimilar title.

In the fpirit of true philofophy, that great man obferves, that the fame fubject may admit, and even require, various divifions, according to the different points of view from which it is contemplated; and we doubt not but, if he had been afked, he would candidly have acknowledged, that the divifions and arrangement of the Encyclopædia Britannica are calculated to anfwer every purpofe which can be expected from a general repofitory of arts, fciences, and mifcellaneous literature. They are fuch as muft give to readers of every defcription the moft eafy accefs to the objects of their purfuit: for whilft the philofopher or fyftematic artift may be fully and regularly informed by turning to the general name of the fcience or art which he wifhes to explore, the man who has occafion to confult only particular topics will find them illuftrated under the terms by which they are denominated. Contemplated from this point of view, the arrangement of the Encyclopædia Britannica needs not fhrink from a comparifon even with that of the *Encyclopédie Methodique;* for though that voluminous work, confifting of a dictionary of dictionaries, may have the appearance of being more fyftematically arranged; yet we, who have had occafion to confult it frequently, have never found our object the more readily for having been obliged to travel in queft of it through different alphabets.

A dictionary, in which the feveral arts and fciences are digefted into diftinct treatifes or fyftems, whilft the various detached parts of knowledge a e explained in the order of the alphabet, feems indeed to have received the beft form of which fuch a work is fufceptible; and may certainly be made to anfwer one end, which more philofophical arrangements never can accomplifh. Under the various letters of the alphabet, it is obvious that the whole circle of the fciences may be completely exhaufted; and that every difcovery, ancient or recent, may be referred to the particular fyftem which it

Such is that great and general analyfis of knowledge, which has by fome of our correfpondents been recommended to us in terms of the higheft praife, and to which elegance and accuracy cannot perhaps be refufed. Its utility, however, as prefixed to a dictionary of arts and fciences, is not very apparent. From each word, which in this table is printed in capitals, many branches are made to fpring, which in the dictionary are all treated as feparate articles. Thus from Meteorology we are referred, in a fubordinate analyfis, to Air and the Atmosphere; including, 1ft, The hiftory of its contents, Æther, Fire, Vapour, Exhalation, &c. 2d, Meteors formed therein; as Cloud, Rain, Shower, Drop, Snow, Hail, Dew, Damp, &c. Rainbow, Parhelion, Halo, Thunder, Waterspout, &c. Winds, Monsoon, Hurricane, and the like. As every word printed in capitals, as well in this fubordinate divifion as in the general table, is the title of an article treated feparately in the Cyclopædia, we muft turn backwards and forwards through more than 24 references before we come at the detached topics, which we are directed to unite into a fyftem of Meteorology. The number of articles which muft be united in the fame manner to conftitute the Compiler's fyftem of Metaphysics is upwards of 48; and thofe which are referred to Theology above 300!

tends to confute or to confirm, without having recourſe to the awkward expedient of employing ſeveral alphabets, or the ſtill more inconvenient arrangement by which the ſyſtems themſelves are broken into fragments.

But on this topic it is needleſs to expatiate. The very favourable reception with which the two former editions of the Encyclopædia Britannica were honoured by the Public; the ſtill greater encouragement which has been given to the preſent; and the adoption of the plan by the editors of other repoſitories of arts and ſciences—bear ample teſtimony to the excellence of the arrangement. On this ſubject we expreſs ourſelves with the greater eaſe and the greater confidence, that we cannot be accuſed of flattering our own vanity, or publiſhing our own praiſes; for the merit of forming the arrangement, as well as of introducing into the Work various branches of knowledge, from which, as they are not generally to be found in dictionaries, it derives a juſt claim to the favour of the Public, belongs not to the Compilers of the preſent Edition.

After ſurveying any particular art or ſcience, our curioſity is excited to acquire ſome knowledge of the private hiſtory of thoſe eminent perſons by whom it was invented, or has been cultivated and improved. To gratify this curioſity, thoſe who formed the plan of the Encyclopædia Britannica reſolved to enrich it with a department not to be found in any prior collection of the ſame kind except the French *Encyclopédie*.

Of all the various ſpecies of narrative-writing, it is acknowledged that none is more worthy of cultivation than BIOGRAPHY; ſince none can be more delightful or more uſeful, none can more certainly enchain the heart by irreſiſtible intereſt, or more widely diffuſe inſtruction to every diverſity of condition. Its tendency to illuſtrate particular paſſages in general hiſtory, and to diffuſe new light through ſuch arts and ſciences as were cultivated by the perſons whoſe lives are related, are facts too obvious to require proof. It exhibits likewiſe the human character in every poſſible form and ſituation. It not only attends the hero through all the buſtle of public life, but purſues him to his moſt ſequeſtered retirements. It ſhows how diſtinguiſhed characters have been involved in misfortunes and difficulties; by what means they were extricated; or with what degree of fortitude and dignity they diſcharged the various functions, or ſuſtained the viciſſitudes, ſometimes proſperous and ſometimes adverſe, of a checquered and a fluctuating life. In ſuch narratives men of all ranks muſt feel themſelves intereſted; for the high and the low, as they have the ſame faculties and the ſame ſenſes, have no leſs ſimilitude in their pains and pleaſures; and therefore in the page of honeſt biography, thoſe whom fortune or nature has placed at the greateſt diſtance, may mutually afford inſtruction to each other. For theſe reaſons it is, that every man of learning and taſte has eſteemed the biographical labours of Plutarch among the moſt valuable and intereſting remains of antiquity.

The lives and characters, therefore, of ſuch perſons as have excelled in the arts either of war or of peace, of ſuch as have diſtinguiſhed themſelves either on the theatre of action or in the receſs of contemplation, will be found in the Encyclopædia Britannica alphabetically diſpoſed under their proper names. Many indeed are omitted, for whom the reader will naturally look; ſome becauſe, in the order of the alphabet, we had paſſed the initial letters of their names before we had intelligence of their deaths; others, through the inadvertency, whether excuſable or not, of the Editors; ſeveral, for a reaſon which ſhall be afterwards aſſigned for omiſſions of a different kind, and perhaps of greater importance; and a very few from the contemptuous refuſal of their friends to anſwer the Editor's letters reſpectfully requeſting the neceſſary information (B).

But

(B) Of this treatment we have not indeed often had occaſion to complain. While men of the firſt eminence in church and ſtate have readily anſwered the letters that were addreſſed to them, and either communicated the in-

But while one part of our readers will regret that we have given no account of their favourite philoſopher, hero, or ſtateſman, others may be diſpoſed to remark, that we have dragged from obſcurity the names of many perſons who were no proper objects of ſuch public regard. To theſe we can only reply, that, with the greateſt biographer of modern times, we have long thought that there has rarely paſſed a life of which a faithful narrative would not be uſeful; and that in the lives of the moſt obſcure perſons, of whom we have given any account, we ſaw ſomething either connected with recent diſcoveries and public affairs, or which we thought capable of affording a leſſon to great multitudes in ſimilar circumſtances.

Between eminent atchievements and the ſcenes where they were performed, there is a natural and neceſſary connection. The character of the warrior is connected with the fields of his battles; that of the legiſlator, with the countries which he civilized; and that of the traveller and navigator, with the regions which they explored. Even when we read of the perſons by whom, and the occaſions on which, any particular branch of knowledge has been improved, we naturally wiſh to know ſomething of the places where ſuch improvements were made. This curioſity, ſo natural and ſo laudable, has been frequently felt by ourſelves during the compilation of this Work; and to gratify it in others, we have ſubjoined to the name of every conſiderable place an account of its ſituation, its climate, its ſoil, its peculiarities, its inhabitants, with their manners, cuſtoms, and arts; its revolutions, laws, and government, with whatever elſe appeared neceſſary for the reader's information, and at the ſame time admiſſible into a Work of ſuch variety and extent. It is indeed probable, that by many of our readers we ſhall be thought to have done too much rather than too little in this department; and to have filled our pages with accounts of towns and villages not of ſufficient importance to demand general attention. But were it known how many of ſuch places we have excluded from our Work, though recommended to us by ſome of our moſt obliging correſpondents, thoſe who reflect upon the different taſtes of mankind, and conſider that we wrote for the Public at large, would forgive us for having occaſionally employed a few ſentences in the deſcription of others, which, whatever be their real importance, could not have been omitted without diſappointing a very numerous claſs of readers.

The knowledge of hiſtory is ſo important, not only to the ſtateſman and the legiſlator, to whom indeed it is abſolutely neceſſary, but likewiſe to every man who moves in a ſphere above that of the loweſt vulgar, that a Work profeſſing to be a general repoſitory of arts, ſciences, and literature, would be exceedingly defective, if it did not contain ſome information of the tranſactions of thoſe who have been in poſſeſſion of the world before us; of the various revolutions of ſtates and empires; and of all the other means which have contributed to bring every thing into the ſtate in which we behold it. Fully aware of this, the Compilers of the Encyclopædia Britannica, beſides giving a general view of univerſal hiſtory and chronology, have enriched this edition with a ſhort, though they hope luminous, detail of the progreſs of each particular nation, which from the remoteſt period to the preſent time has acted a conſpicuous part on the theatre of the world. The reader therefore will here find a very comprehenſive view of Civil History, ancient and modern, in all its branches. Nor have the hiſtories of Nature and Religion been neglected. Of the former, it is not perhaps too much to ſay, that in all the ſubdiviſions of its three great kingdoms, it will be found more fully, more accurately, and more ſcientifically, detailed in this Work than in any other dictionary which has yet been publiſhed. Of the latter, a brief view is given under the general article History; the unavoidable defects of which are in a great meaſure

information which was requeſted, or politely aſſigned reaſons for wiſhing the lives of their friends not to be publiſhed in the Encyclopædia Britannica, the Editor recollects but two men who maintained a ſullen ſilence; and theſe he cannot conſider as moving in a ſphere much higher than his own.

ſupplied by the accounts that will be found, under their proper denominations, of all the conſiderable ſects and opinions which have prevailed in the religious world from the earlieſt periods to the preſent day.

Such was the plan of the ſecond edition of the Encyclopædia Britannica; to which, as it ſeems hardly capable of improvement, the Compilers of the third have, with a few ſlight variations, ſtrictly adhered. Still, however, there was ample room for the efforts of all their induſtry and all their learning; for the rapid progreſs of the phyſical ſciences had rendered the labours of their predeceſſors in many departments uſeleſs. Beſides the introduction of ſome thouſands of new articles, there are not many of great importance, thoſe in biography and geography alone excepted, which ſtand in this Edition as they ſtood in the laſt. Such recent diſcoveries as could be introduced, have been mentioned with reference to their proper authors; and, while the ſeveral ſciences have been treated more fully and ſyſtematically, greater care has been employed to trace the hiſtory of each from its firſt invention, and to apply them all to the arts of life.

To accompliſh a taſk ſo arduous and ſo important, neither labour nor expence has been ſpared. Literary journals; the memoirs and tranſactions of philoſophic ſocieties; and all the moſt valuable dictionaries of arts and ſciences, both in our own and in other languages, have been conſtantly conſulted. The works of the moſt eminent authors, as well ancient as modern, who have written on any particular art or ſcience, have been collected and compared. Such of them as treat of topics, about which there is no room for controverſy, and are at the ſame time ſuſceptible of abridgement, have been abridged with the greateſt care; whilſt others, more conciſe and tenacious of their ſubjects, have been more cloſely purſued and more faithfully retained. Upon thoſe branches of ſcience on which the works of other authors furniſhed nothing fit for the purpoſe of the Editors, original eſſays and treatiſes are inſerted, which were compoſed either by themſelves, or by ſuch of their friends as they knew to be intimately acquainted with the ſubject. On diſputed points, whether in the phyſical or moral ſciences, arguments and objections have been diſplayed in their full force; and of each of the various ſects into which the Chriſtian church is divided, the account is generally given by the moſt eminent clergyman of that ſect to whom the Editors could find acceſs.

After the utmoſt exertions, however, of our attention and induſtry, we are ſenſible, perhaps more ſenſible than any of our readers, that the Work paſſes from our hands in a ſtate far from perfection; and that the man who ſhall not diſcover in the Encyclopædia Britannica miſtakes, needleſs repetitions, and even culpable omiſſions, will bring to the examination of it no great ſtock of general knowledge. But for theſe offences the Editors perhaps need no other apology than what will be furniſhed by the nature of the Work and the hiſtory of its publication.

In a collection ſo extenſive and multifarious, a few miſtakes, repetitions, and omiſſions, might ſurely be paſſed over without ſeverity of cenſure, although the publication had from the beginning to the end been ſuperintended by the ſame man; but they will be allowed to have been almoſt unavoidable, when it is known that, after the Work was far advanced, it was committed to the care of a new Editor, who, though he was in a great degree a ſtranger to the contents of the printed volumes, found no clue of his predeceſſor's which could guide him accurately through thoſe to be compiled.

We beg it to be underſtood, that this obſervation is not made with a view to remove any ſhare of blame from the ſecond to the firſt Editor; for Mr Colin Macfarquhar, who conducted the publication beyond the middle of the twelfth volume, was a man whom few who knew him will be diſpoſed to blame, and on whoſe induſtrious integrity thoſe who knew him beſt muſt admit that it would be difficult to beſtow too much praiſe. Born in Edinburgh of parents reſpectable, though not affluent, he was, at an early period of life, bound an apprentice to a printer. This profeſſion gave him a taſte for ſcience and literature, or rather furniſhed him with opportunities

tunities of cultivating the taſte which he derived from nature; and he ſoon became well acquainted with the moſt popular writers in natural hiſtory and in natural and moral philoſophy. When he opened a printing-houſe of his own, rectitude of conduct quickly recommended him to friends and to employment; and the unremitted proſecution of his ſtudies eminently qualified him for ſuperintending the publication of a new dictionary of arts, ſciences, and literature; of which, under the title of ENCYCLOPÆDIA BRITANNICA, the idea had been conceived by him and his friend Mr Andrew Bell engraver. By whom theſe gentlemen were aſſiſted in digeſting the plan which attracted to that Work ſo much of the public attention, or whether they had any aſſiſtance, are queſtions in which our readers cannot be intereſted. Suffice it to ſay, that Mr Macfarquhar had the ſole care of compiling the preſent Edition; and that, with the aid of a very few literary friends, he brought it down to the article MYSTERIES, in the twelfth volume, when he was cut off in the 48th year of his age by a death which, though not ſudden, was perhaps unexpected. His career was indeed ſhort; but of him it may be ſaid with as much propriety as of moſt men, *Nemo parum diu vixit, qui virtutis perfectæ perfecto functus eſt munere.*

AMONG his literary correſpondents was the Reverend Dr Gleig of Stirling, who had written for him various articles, of which ſome were publiſhed during his lifetime and others in their order after his death. Theſe ſhall be afterwards enumerated with thoſe furniſhed by other occaſional contributors; but they are mentioned at preſent, becauſe they account for that partial regard of Mr Macfarquhar for their author, which, on the death of the former, induced the truſtees for his children, together with Mr Bell the ſurviving partner, to requeſt the latter to undertake the taſk which their deceaſed friend had hitherto diſcharged with ſo much credit to himſelf. In this propoſal, after ſome heſitation on account of his diſtance from Edinburgh, Dr Gleig acquieſced; but when he entered on his new office, he found matters in a ſtate of no little confuſion. Mr Macfarquhar, though his death had not been long expected, had laboured long under a complication of diſeaſes; the conſequence of which was, that the materials which he had prepared for the preſs were almoſt exhauſted; and of thoſe which were firſt called for, ſome had not paſſed through his correcting hand.

THIS circumſtance may perhaps account for ſome defects and inaccuracies in that part of the Work, to which the ſecond Editor looks back with the leaſt ſatisfaction: but that which muſt be his apology for ſeveral repetitions and omiſſions, was the neglect of his predeceſſor during his laſt illneſs to make an intelligible index to his own labours. From the want of ſuch a neceſſary guide, Dr Gleig was perpetually liable, notwithſtanding his utmoſt circumſpection, to give under one title an explanation of ſubjects which had been before explained under another; and to omit articles altogether, from a perſuaſion that they had been diſcuſſed in ſome preceding volume under the general ſyſtem to which they belong.

NEITHER his repetitions nor omiſſions, however, are ſo many as ſome have ſuppoſed them; for what has been haſtily cenſured as a repetition, is frequently nothing more than the neceſſary reſumption of ſome important ſubject. Availing himſelf of the excellence of the plan upon which the Encyclopædia Britannica is conſtructed, he took the opportunity, when he found any ſyſtem ſuperficially treated, to ſupply its defects under ſome of the detached articles belonging to it. Of this he ſhall mention as one inſtance HYDROSTATICS; which, conſidered as a ſyſtem, muſt be confeſſed to be defective; but he truſts that its defects are in a great meaſure ſupplied under the ſeparate articles RESISTANCE *of Fluids*, RIVER, SPECIFIC *Gravity*, and *Water-*WORKS.

THAT in the Encyclopædia Britannica no account is given of ſome things which ſhould have a place in a general repoſitory of arts, ſciences, and miſcellaneous literature, muſt be acknowledged; but it muſt likewiſe be acknowledged that ſuch omiſſions are neither numerous nor very important; for many ſubjects, which have been ſuppoſed to be omitted, are treated under titles different from thoſe under which they have

have been looked for. Thus the method of calculating compound interests, which one of our correspondents cannot find in our Work, is taught in the article Algebra; that of coating mirrors, of which another complains that no account is given, will be found under the term Foliating; and though it may be true, according to the peevish remark of a third, that the reader is nowhere directly instructed how to grind optical glasses, yet if he read the article Glass-*Grinding*, and understand the doctrine of lenses as laid down in the article Optics, he will easily, if an artist, discover a method of performing that operation for himself.

Omissions, however, there are towards the end of the Work; not the consequence of carelessness, but the offspring of necessity.

In an address to the Purchasers of the Encyclopædia Britannica, subjoined to the ninth volume, the proprietors gave a rash promise to comprehend the whole of their undertaking within the limits of eighteen; and if intervening discoveries should make it necessary, to enlarge the last volumes in quantity without any additional charge to Subscribers.

That the promise was rash, a moment's reflection should have taught them; for in the present rapid progress of physical science, when new discoveries are daily made, it was obviously impossible, at so early a period, to ascertain with precision how many volumes would be necessary to bring a Work of such comprehensive variety to the utmost perfection of which it is capable. This was indeed soon discovered; but the proprietors shrunk not from their engagement, which they determined to fulfil to the utmost extent of its meaning, till the additional tax, which in 1795 was laid upon paper, involved them in difficulties which they had not foreseen. By the act of parliament they were indeed authorised to reimburse themselves by raising the subscription-price of their volumes; but they chose rather to submit to a diminution of profit, than to take even a legal advantage of that Public by which they had hitherto been so generously supported.

To complete their plan, however, in its original extent, was now impossible, without a violation of the sacred duties which they owe to themselves and to their families. In this dilemma the Editor proposed that they should state the case to their Subscribers, of whom he is confident that nine-tenths would have released them from the obligation of their promise: but after long deliberation, they judged that it would be more acceptable to the Public at large to comprehend the Work in the proposed number of volumes, though they should exclude from the last such articles as might be omitted without injury to science or the arts of life. If by any of their readers they shall be thought to have erred in this judgment, let them not, however, be too severely blamed; for they have done much to adhere to the spirit of their promise; and, in the large addition made to the bulk of the last volume, have shewn that they prefer their honour to their interest. Several things have indeed been excluded; but except such recent discoveries as could not be noticed under the last letters of the alphabet, it is believed that very little has been omitted which can be considered as of great or general importance. At any rate, the Editor flatters himself, that the last six volumes of the Encyclopædia Britannica do not disgrace those by which they are preceded, and that the whole will bear to be compared with any other Work of the same kind extant. Imperfect it certainly is: "but if much has been omitted, let it be remembered that much has likewise been performed;" that perfection is not to be looked for in the works of man; and that every compilation of such variety and extent should be examined with the spirit which actuated one of the greatest critics of antiquity when perusing the works of his brother poets:

Verum ubi plura nitent in carmine, non ego paucis
Offendar maculis, quas aut incuria fudit,
Aut humana parum cavit natura.—— Hor. de art. poet.

We

We mentioned our obligations to occaſional contributors; and many of our correſpondents have expreſſed an earneſt deſire to know who theſe contributors have been. As there can be no impropriety in gratifying ſuch a deſire, we ſhall conclude this Preface, by aſſigning the various articles, not compiled by the Editors themſelves, to their reſpective authors: but as many of the writers for the firſt twelve volumes were known to Mr Macfarquhar alone, they will not attribute the omiſſion of their names to culpable deſign, but to irremediable ignorance.

For whatever inſtruction may be conveyed in the articles Anatomy and Surgery the Public is indebted to Andrew Bell, F. S. S. A. one of the proprietors, and the ingenious Mr Fyfe. From the former of theſe gentlemen the world will ſoon receive one of the moſt ſplendid anatomical works which it has yet ſeen; and as the latter has long officiated under Dr Monro as diſſector in the anatomical ſchool of the univerſity of Edinburgh, it is needleſs for us to ſay how well he muſt be acquainted with the ſubjects on which we employed him to write. Aerology, Aerostation, Chemistry, Electricity, Gunnery, Hydrostatics, Mechanics, Meteorology, with moſt of the ſeparate articles in the various branches of natural hiſtory, we have reaſon to believe were compiled by Mr James Tytler chemiſt; a man who, though his conduct has been marked by almoſt perpetual imprudence, poſſeſſes no common ſhare of ſcience and genius. The article Blind was furniſhed by Dr Blacklock and Dr Moyes, both blind themſelves, and both men of ſuperior attainments; the former in elegant literature, and the latter in the phyſical ſciences. We believe that the article Education was compoſed by Mr Robert Heron, author of a hiſtory of Scotland now publiſhing, who likewiſe furniſhed the greater part of what we have publiſhed under the titles Religion and Society. The lives of Johnson and Mary *Queen of Scots*, with the articles Instinct, Love, Metaphysics, Miracle, the hiſtory of Ethics under Moral Philosophy, Oath, Passion, Plastic Nature, Polytheism, Prayer, Slavery, and Supper *of the Lord*, were contributed by Dr Gleig, Editor of the laſt ſix volumes; Grammar (c) and Theology by Dr Gleig and the Reverend James Bruce, A. B: late of Emanuel College, Cambridge; and Motion by Dr Gleig and Mr Tytler. The ſyſtem of Medicine, which was publiſhed in the former edition, was reviſed and improved for the preſent by Andrew Duncan, M. D. Fellow of the Royal Society of Edinburgh, and Profeſſor of the Inſtitutes of Phyſic in the Univerſity. The notes to the article Music were contributed by Dr Blacklock, and the hiſtory of the art by William Maxwell Moriſon, Eſq; advocate, who likewiſe favoured us with what we have publiſhed on the ſcience of Physiognomy. The articles Mysteries, Mythology, and Philology, we owe to the erudition of David Doig, L. L. D. F. S. S. A. maſter of the grammar-ſchool of Stirling, and author of two very ingenious *Letters on the Savage State*, addreſſed to the late Lord Kames. Navigation, Parallax, Pendulum, Projection *of the Sphere*, Ship-Building, and *Naval* Tactics, were furniſhed by Andrew Mackay, L. L. D. F. R. S. E. of Aberdeen, and known to the Public as author of a treatiſe on *the Theory and Practice of finding the Longitude*

(c) Mr Bruce, who communicated the moſt valuable parts of the article Grammar, and who was for many years a ſtudent in the univerſity of St Andrew's, wiſhes, from gratitude to his old maſter, to declare, in this public manner, that, to the inſtructions of Dr Hunter, profeſſor of humanity in that univerſity, he is indebted for much of what philological knowledge he may poſſeſs. We believe indeed that Dr Hunter may claim as his own the theory which we have given of the caſes of nouns, the doctrine concerning the inverſe acceptation of the adjective, and the reſolution of the relative pronoun by means of the prepoſition *of* inſtead of the conjunction *and*. There is nothing elſe in our article which the attentive reader may not find in the grammatical writings of *Voſſius*, *Scaliger*, *Sanctius*, *Perizonius*, *Wallis*, *Ruddiman*, *Harris*, *Horne-Tooke*, and *Dr Gregory* of Edinburgh. Diſcoveries in grammar are not indeed to be looked for. They are nearly allied to thoſe in metaphyſics; of which, it has been well obſerved by one of the acuteſt writers of the age, that the very appearance ſhould be rejected as an error, if not as an impoſition, upon mankind.

Longitude at Sea or Land. John Robiſon, M. A. ſecretary to the Royal Society of Edinburgh, and profeſſor of natural philoſophy in the Univerſity, did the Editor the honour of contributing to the Encyclopædia Britannica the valuable articles PHYSICS, PNEUMATICS, PRECESSION *of the Equinoxes*, PROJECTILES, PUMPS, RESISTANCE *of Fluids*, RIVER, ROOF, ROPE-*Making*, ROTATION, SEAMANSHIP, SIGNALS, SOUND, SPECIFIC GRAVITY, STATICS, STEAM and STEAM-*Engine*, STRENGTH *of Materials*, TELESCOPE, TIDE, *Articulating* TRUMPET, VARIATION *of the Compaſs*, and *Water*-WORKS. PHILOSOPHY is the joint production of Profeſſor Robiſon and Dr Gleig. PHYSIOLOGY was furniſhed by John Barclay, M. D. of Edinburgh, whoſe merits, if the Editor be not partial to his friend, it will raiſe high in the eſtimation of men of ſcience. The eſſays on PREDESTINATION and PROVIDENCE were contributed by Robert Forſyth, Eſq; advocate; the account of the *French* REVOLUTION by Mr Forſyth and Dr Gleig; and OXYGEN and PHLOGISTON by John Rotheram, M. D. profeſſor of natural philoſophy in the Univerſity of St Andrew's.

The other contributors to the firſt part of the Work we cannot enumerate; but we know that much uſeful information was occaſionally communicated by Dr Latham of Dartford in Kent, the celebrated ornithologiſt; by Dr William Wright phyſician-general to the forces in the Weſt Indies under the command of Sir Ralph Abercrombie; by the Reverend J. Hawkins, vicar of Halſted in Eſſex; by the late Mr Adams, mathematical inſtrument-maker to his Majeſty; and by Mr William Jones, optician in Holborn, London. There is, however, no man to whom the Proprietors of the Encyclopædia Britannica feel themſelves under greater obligations than to Dr Black, for the very handſome offer which he made to the perſon who was at firſt entruſted with the chemical department of the Work. And while they expreſs thus publicly their gratitude to him, may not the Editor declare how much he is indebted to his two aſſiſtants, the Reverend James Walker, M. A. of St John's College, Cambridge, and Mr James Thomſon of Crieff, preacher in the church of Scotland? Of theſe gentlemen, who ſucceſſively had the care of the Work when he was neceſſarily abſent, he could always ſay, *Quibus in rebus ipſi intereſſe non poſſumus, in his, operæ noſtræ vicaria fides amicorum ſupponitur.*

ENCYCLOPÆDIA

ENCYCLOPÆDIA BRITANNICA.

A.

A THE firſt letter of the alphabet, in all the known languages of the world, that of Ethiopia excepted, in which it is the 13th. It has deſervedly the firſt place in the alphabet, on account of its ſimplicity, very little more being neceſſary to its pronunciation than opening the mouth.

In the Engliſh language A is the mark of three different ſounds, termed, by our grammarians, the *broad*, the *open*, and the *ſlender* A. The firſt reſembles that of the German A, is found in ſeveral monoſyllables, as *wall*, *ſalt*, &c. and is pronounced as *au* in *cauſe*. It is probable that the Saxons expreſſed only this broad ſound of the letter, as it is ſtill commonly retained in the northern diſtricts of England, and univerſally throughout Scotland; as, *tauk* for *talk*, *wauk* for *walk* or *wake*.—The open A reſembles that of the Italians in *adagio*, and is the ſame with that of *a* in *father*, *rather*, &c. The ſlender ſound is peculiar to the Engliſh language, and reſembles the ſound of the French diphthong *ai* in *pais*, or their *a* maſculine, or perhaps it is a middle ſound between them: it is exemplified in *place*, *waſte*, &c. alſo in *toleration*, *juſtification*, and all other words ending with *ation*.

A is ſometimes added after words in burleſque poetry; in which caſe it only makes an additional ſyllable without any alteration of the ſenſe, as the interjection O very often does in our ballads. It is alſo ſometimes redundant, as in the words *ariſe*, *awake*, &c. which are not different in ſignification from *riſe*, *wake*, &c.

It is ſometimes a word, either noun or interjection; in which laſt caſe it is commonly an expreſſion of grief, and joined with the aſpirate, as *ah!* When a noun, it is only with reſpect to itſelf; as *great* A, *little* a, &c.

A is very frequently uſed as an article; in which caſe it has no plural ſignification, and is uſed to denote the number *one*, as *a* houſe, *a* field, &c. When placed as an article before any of the vowels, *y* and *w* only excepted, it is joined with the letter *n*; as, *an* iſland, *an* orator, &c.—In the three following caſes it is a prepoſition. 1. When it goes before a participle, or noun derived from a participle; as, I am *a* doing this or that. 2. When uſed before local ſurnames, as Cornelius *a* Lapide, Thomas *a* Kempis, &c. 3. When it is uſed in compoſition; as, *a* foot, *a* ſleep, &c. In ſome inſtances it denotes the proportion of one thing to another; as, ſo much *a* week, *a* man, *a* head, &c.

A, among the ancients, was a numeral letter, and ſignified 500; and when a daſh was added on the top, $\bar{A}$, 5000.

A, in the Julian calendar, is the firſt of the ſeven DOMINICAL letters. It had been in uſe among the Romans long before the eſtabliſhment of Chriſtianity, as the firſt of the eight *nundinales litteræ;* in imitation whereof it was that the dominical letters were firſt introduced.

A is alſo an abbreviation uſed with different intentions. Hence,

A, among logicians, is uſed to denote an univerſal affirmative propoſition; according to the verſe,

Aſſerat A, negat E, verùm generaliter ambæ.

Thus, in the firſt figure, a ſyllogiſm conſiſting of three univerſal affirmative propoſitions, is ſaid to be in Bār-bā-rā; the *A* thrice repeated, denoting ſo many of the propoſitions to be univerſal, *&c.* See BARBARA.

A, among the Romans, was uſed in the giving of votes or ſuffrages.—When a new law was propoſed, each voter had two wooden ballots put in his hand; the one marked with a capital *A*, ſignifying *antiquo*, q. d. *antiquam volo;* and the other with *V. R.* for *uti rogas*. Such as were againſt the law, caſt the firſt into the urn; as who ſhould ſay, I refuſe it, I antiquate it; or, I like the ancient law, and deſire no innovation.

A, in the trials of criminal cauſes, alſo denoted abſolution: whence Cicero, *pro Milone*, calls *A*, *littera ſalutaris*, a ſaving letter.—Three ballots were diſtributed to each judge, marked with the letters, *A* for *abſolvo*, I acquit; *C* for *condemno*, I condemn; and *N. L.* for *non liquet*, It is not clear. From the number of each caſt into the urn, the prætor pronounced the priſoner's fate. If they were equal in number, he was abſolved.

A, in the ancient inſcriptions of marbles, &c. occaſionally ſtands for *Auguſtus*, *ager*, *aiunt*, &c. When double, it denotes *Auguſti;* when triple, *aurum*, *argentum*, *æs;* and ſometimes its meaning can only be known by the reſt of the inſcription. Iſidore adds, that when it occurs after the word *miles* (ſoldier), it denotes him young. On the reverſe of ancient medals, it denotes them ſtruck by the city of Argos, ſometimes by that of Athens; but on coins of modern date, it is the mark of Paris.

A, as an abbreviation, is alſo often found in modern writers: as, A. D. for *anno Domini;* A. M. *artium magiſter*, maſter of arts, *&c.*

A, the letter a, with a line above it thus, ā, is uſed

in medical prefcriptions for *ana*, of each; fometimes it is written thus, āā: e. g. ℞ Mel. Sacchar. & Mann. ā, vel āā, ℥j. i. e. Take of honey, fugar, and manna, of each one ounce.

A, put to bills of exchange, is in England an abbreviation for *accepted*, and in France for *accepté*. It is likewife ufual among merchants to mark their fets of books with the letters A, B, C, &c. inftead of the numbers 1, 2, 3, &c.

A. A. A. The chemical abbreviation for Amalgama, or Amalgamation.

AA, the name of feveral rivers in Germany and Swiffeſland.

AACH, a little town in Germany, in the circle of Suabia, near the fource of the river Aach, and almoft equally diftant from the Danube and the lake Conftance. It belongs to the houfe of Auftria. E. Long. 9. 0. Lat. 47. 55.

AAHUS, a little town in Germany, in the circle of Weftphalia, and bifhopric of Munfter. It is the capital of Aahus, a fmall diftrict; has a good caftle; and lies north-eaft of Coesfeldt. E. Long. 7. 1. Lat. 52. 10.

AAM, or Haam, a liquid meafure in common ufe among the Dutch, and containing 128 meafures called *mingles*, each weighing nearly 36 ounces avoirdupoife; whence the *Aam* contains 288 Englifh, and 148$\frac{7}{8}$ pints Paris meafure.

AAR, the name of two rivers, one in Swifferland, and another in Weftphalia in Germany. It is alfo the name of a fmall ifland in the Baltic.

AARASSUS (anc. geog.), a town of Pifidia, in the Hither Afia, thought to be the Anaffus of Ptolemy.

AARON, high-prieft of the Jews, and brother to Mofes, was by the father's fide great grandfon, and by the mother's grandfon, of Levi. By God's command he met Mofes at the foot of mount Horeb, and they went together into Egypt to deliver the children of Ifrael: he had a great fhare in all that Mofes did for their deliverance; the fcriptures call him the prophet of Mofes, and he acted in that capacity after the Ifraelites had paffed over the Red Sea. He afcended mount Sinai with two of his fons, Nadab and Abihu, and feventy elders of the people; but neither he nor they went higher than half way, from whence they faw the glory of God; only Mofes and Jofhua went to the top, where they ftaid forty days. During their abfence, Aaron, overcome by the people's eager intreaties, fet up the golden calf, which the Ifraelites worfhipped by his confent. This calf has given rife to various conjectures. Some rabbies maintain that he did not make the golden calf; but only threw the gold into the fire, to get rid of the importunities of the people; and that certain magicians, who mingled with the Ifraelites at their departure from Egypt, caft this gold into the figure of a calf. According to fome authors, the fear of falling a facrifice to the refentment of the people by giving a refufal, made Aaron comply with their defire: and they allege alfo, that he hoped to elude their requeft, by demanding of the women to contribute their ear-rings, imagining they would rather choofe to remain without a vifible deity, than be deprived of their perfonal ornaments. This affair of the golden calf happened in the third month after the Ifraelites came out of Egypt. In the firft month of the following year, Aaron was appointed by God high-prieft; which office he executed during the time that the children of Ifrael continued in the wildernefs. He died in the fortieth year after their departure from Egypt, upon mount Hor, being then 123 years old; A. M. 2522, of the Julian period 3262, before the Chriftian æra 1452. With regard to the attempts of the Egyptian magicians to imitate the miracles performed by his rod, fee fome remarks under the article Magician.

Aaron and Julius (Saints), fuffered martyrdom together, during the perfecution under the emperor Dioclefian, in the year 303, about the fame time with Saint Alban the protomartyr of Britain. We are no-where told what their Britifh names were, it being ufual with the Chriftian Britons, at the time of baptifm, to take new names from the Greek, Latin, or Hebrew. Nor have we any certainty as to the particulars of their death; only that they fuffered the moft cruel torments. They had each a church erected to his memory; and their feftival is placed, in the Roman martyrology, on the firft of July.

Aaron, or *Harun*, *Al Rafchid*, a celebrated khalif, or Mahometan fovereign of the Saracen empire; whofe hiftory is given under the article Bagdad.

Aaron Harifchon, a learned rabbi and caraite in the 15th century, wrote an Hebrew grammar, printed at Conftantinople in 1581; probably the fame with Aaron the caraite, who wrote a commentary on the five books of Mofes, which is in MS. in the French king's library.

AARSENS (Francis), Lord of Someldyck and Spyck, was one of the greateft minifters for negociation the United Provinces could ever boaft of. His father, Cornelius Aarfens, was Regifter to the States; and being acquainted with Mr Pleffis Mornay, at the Court of William Prince of Orange, he prevailed upon him to take his fon under him, with whom he continued fome years. John Olden Barnevelt, who prefided over the affairs of Holland and all the United Provinces, fent him afterwards agent into France, where he learned to negociate under thofe profound politicians Henry IV. Villeroy, Silleri, Roffie, Jaonnin, &c. and he acquitted himfelf in fuch a manner as to obtain their approbation. Soon after, he was invefted with the character of ambaffador, being the firft who was recognifed as fuch by the French court; at which time Henry IV. declared, that he fhould take precedence next to the Venetian minifter. He refided in France 15 years; during which time he received great marks of efteem from the king, who created him a knight and baron; and for this reafon he was received amongft the nobles of the province of Holland. However, he became at length fo odious to the French court, that they defired to have him recalled. He was afterwards deputed to Venice, and to feveral German and Italian princes, upon occafion of the troubles in Bohemia. He was the firft of three extraordinary ambaffadors fent to England in 1620, and the fecond in 1641; in which latter embaffy he was accompanied by the Lord of Brederode as firft ambaffador, and Heemfvliet as third, to treat about the marriage of Prince William, fon to the Prince of Orange. He was likewife ambaffador-extraordinary at the French court in 1624, and the Cardinal de Richlieu having juft

just taken the administration of affairs into his hands, and knowing he was an able man, made use of him to serve his own purposes. He died in a very advanced age; and his son, who survived him, was reputed the wealthiest man in Holland.

Aarsens (Peter), a painter, called in Italy Pietro Longo, because of his stature, was born at Amsterdam 1519. He was eminent for all kinds of subjects; but was particularly famous for altar-pieces, and for representing a kitchen with its furniture: he had the pain to see a fine altar-piece of his destroyed by the rabble in the insurrection 1566, though a lady of Alcmaer offered 200 crowns for its redemption.

AARTGEN, or Aertgen, a painter of merit, was the son of an woolcomber, and born at Leyden in 1498. He worked at his father's trade until he had attained the age of eighteen; and then, having discovered a genius for designing, he was placed with Cornelius Engelheihtz, under whom he made a considerable progress in painting. He became so distinguished, that the celebrated Francis Floris went to Leyden out of mere curiosity to see him. He found him inhabiting a poor half ruined hut, and in a very mean style of living: He solicited him to go to Antwerp, promising him wealth and rank suitable to his merit; but Aartgen refused, declaring that he found more sweets in his poverty than others did in their riches. It was a custom with this painter never to work on Mondays, but to devote that day, with his disciples, to the bottle. He used to stroll about the streets in the night, playing on the German flute, and in one of these frolics was drowned in 1564.

AASAR (anc. geog.), a town of Palestine, in the tribe of Judah, situate between Azotus and Ascalon. In Jerome's time it was an hamlet.

AB, the eleventh month of the civil year of the Hebrews, and the fifth of their ecclesiastical year, which begins with the month Nisan. It answers to the moon of July; that is, to part of our month of the same name, and to the beginning of August: it consists of thirty days. The Jews fast on the first of this month, in memory of Aaron's death; and on the ninth, because on that day both the temple of Solomon, and that erected after the captivity, were burnt; the former by the Chaldeans, and the latter by the Romans. The same day is also remarkable among that people for the publication of Adrian's edict, wherein they were forbid to continue in Judea, or even to look back when at a distance from Jerusalem, in order to lament the desolation of that city. The 18th of the same month is also a fast among the Jews; because the lamp in the sanctuary was that night extinguished, in the time of Ahaz.

Ab, in the Syriac calendar, is the name of the last summer-month. The first day of this month they called *Suum Miriam*, the fast of the virgin, because the eastern Christians fasted from that day to the fifteenth, which was therefore called *Fathr-Miriam*, the cessation of the fast of the virgin.

ABA (or rather Abau) Hanifah or Hanfah, sirnamed Al-Nooma, was the son of Thabet, and born at Coufah in the 80th year of the Hegira. This is the most celebrated doctor of the orthodox Mussulmans, and his sect holds the principal esteem among the four which they indifferently follow. Notwithstanding this, he was not very well esteemed during his life, insomuch that the khaliff Almansor caused him to be imprisoned at Bagdad, for having refused to subscribe to the opinion of absolute predestination, which the Mussulmans call Cadha. But afterwards Abou Joseph, who was the sovereign judge or chancellor of the empire under the khaliff Hadi, brought his doctrine into such credit, that it became a prevailing opinion, That to be a good Mussulman was to be a Hanifite. He died in the 150th year of the Hegira, in the prison of Bagdad aforesaid: and it was not till 335 years after his death, that Melick Schah, a sultan of the Selgiucidan race, built for him a magnificent monument in the same city, whereto he adjoined a college peculiarly appropriated to such as made a profession of this sect. This was in the 485th year of the hegira, and Anno Christi 1092. The most eminent successors of this doctor were Ahmed Benali, Al Giassas, and Al Razi who was the master of Nassari; and there is a mosque particularly appropriated to them in the temple of Mecca.

Aba, *Abas*, *Abos*, or *Abus*, (anc. geog.), the name of a mountain of Greater Armenia, situated between the mountains Niphatos and Nibonis. According to Strabo, the Euphrates and Araxes rose from this mountain; the former running eastward, and the latter westward.

Aba. See Abæ.

ABACÆNA (anc. geog.), a town of Media, and another of Cana in the Hither Asia.

ABACÆNUM (anc. geog.), a town of Sicily, whose ruins are supposed to be those lying near Trippi, a citadel on an high and steep mountain not far from Messina. The inhabitants were called *Abacænini*.

ABACATUAIA, in ichthyology, a barbarous name of the zeus vomer. See Zeus.

ABACH, a market-town of Germany, in Lower Bavaria, seated on the Danube. It is remarkable for Roman antiquities, and for springs of mineral waters which are said to be good for various distempers. E. Long. 11. 56. Lat. 48. 53.

ABACINARE, or Abbacinare, in writers of the middle age, a species of punishment, consisting in the blinding of the criminal, by holding a hot bason or bowl of metal before his eyes.

ABACK (a sea-term), the situation of the sails when their surfaces are flatted against the masts by the force of the wind. The sails are said to be *taken aback* when they are brought into this situation, either by a sudden change of the wind, or by an alteration in the ship's course. They are *laid aback*, to effect an immediate retreat, without turning to the right or left; or, in the sea-phrase, to give the ship *stern-way*, in order to avoid some danger discovered before her in a narrow channel, or when she has advanced beyond her station in the line of battle, or otherwise. The sails are placed in this position by slackening their lee-braces, and hauling in the weather ones; so that the whole effort of the wind is exerted on the forepart of their surface, which readily pushes the ship astern, unless she is restrained by some counteracting force. It is also usual to spread some sail aback near the stern, as the mizzen-top-sail, when a ship rides with a single anchor in a road, in order to prevent her from approaching it so as to entangle the flukes of it with her slackened cable, and thereby loosen it from the ground.

ABACOT, the name of an ancient cap of ſtate worn by the kings of England, the upper part whereof was in the form of a double crown.

ABACTORS, or Abactores, a name given to thoſe who drive away, or rather ſteal, cattle by herds, or great numbers at once; and are therefore very properly diſtinguiſhed from *fures*, or thieves.

ABACUS, among the ancients, was a kind of cupboard or buffet. Livy, deſcribing the luxury into which the Romans degenerated after the conqueſt of Aſia, ſays, They had their *abaci*, beds, *&c.* plated over with gold.

Abacus, among the ancient mathematicians, ſignified a table covered with duſt, on which they drew their diagrams; the word in this ſenſe being derived from the Phœnician *abak*, duſt.

Abacus, in architecture, ſignifies the ſuperior part or member of the capital of a column, and ſerves as a kind of crowning to both. Vitruvius tells us the abacus was originally intended to repreſent a ſquare tile laid over an urn, or rather over a baſket. See Architecture, n° 15.—The form of the abacus is not the ſame in all orders: in the Tuſcan, Doric, and Ionic, it is generally ſquare; but in the Corinthian and Compoſite, its four ſides are arched inwards, and embelliſhed in the middle with ſome ornament, as a roſe or other flower. Scammozzi uſes *abacus* for a concave moulding on the capital of the Tuſcan pedeſtal; and Palladio calls the plinth above the echinus, or boultin, in the Tuſcan and Doric orders, by the ſame name.

Abacus is alſo the name of an ancient inſtrument for facilitating operations in arithmetic. It is variouſly contrived. That chiefly uſed in Europe is made by drawing any number of parallel lines at the diſtance of two diameters of one of the counters uſed in the calculation. A counter placed on the loweſt line, ſignifies 1; on the 2d, 10; on the 3d, 100; on the 4th, 1000, &c. In the intermediate ſpaces, the ſame counters are eſtimated at one half of the value of the line immediately ſuperior, *viz.* between the 1ſt and 2d, 5; between the 2d and 3d, 50; &c. See the figure on Plate I. where the ſame number, 1788 for example, is repreſented under both diviſions by different diſpoſitions of the counters.

Abacus is alſo uſed by modern writers for a table of numbers ready caſt up, to expedite the operations of arithmetic. In this ſenſe we have *Abaci* of addition, of multiplication, of diviſion.

Chineſe Abacus. See Swanpan.

Abacus Pythagoricus, the common multiplication-table, ſo called from its being invented by Pythagoras.

Abacus Logiſticus is a rectangled triangle, whoſe ſides, forming the right angle, contain the numbers from 1 to 60; and its area, the facta of each two of the numbers perpendicularly oppoſite. This is alſo called a *canon of ſexageſimals*.

Abacus & Palmulæ, in the ancient muſic, denote the machinery, whereby the ſtrings of Polyplectra, or inſtruments of many ſtrings, were ſtruck with a plectrum made of quills.

Abacus Harmonicus, is uſed by Kircher for the ſtructure and diſpoſition of the keys of a muſical inſtrument, whether to be touched with the hands or the feet.

Abacus Major, in metallurgic operations, the name of a trough uſed in the mines, wherein the ore is waſhed.

ABADDON, is the name which St John in the Revelations gives to the king of the locuſt, the angel of the bottomleſs pit. The inſpired writer ſays, this word is Hebrew, and in Greek ſignifies Ἀπολλυων, *i. e.* a *deſtroyer*. That angel-king is thought to be Satan or the devil: but Mr le Clerc thinks, with Dr Hammond, that by the locuſt which came out of the abyſs, may be underſtood the zealots and robbers, who miſerably afflicted the land of Judea, and laid it in a manner waſte, before Jeruſalem was taken by the Romans; and that Abaddon, the king of the locuſt, may be John of Giſchala, who having treacherouſly left that town a little before it was ſurrendered to Titus, came to Jeruſalem, where he ſoon headed part of the zealots, who acknowledged him as their king, whilſt the reſt would not ſubmit to him. This ſubdiviſion of the zealot party brought a thouſand calamities on the Jews.

ABADIR, a title which the Carthaginians gave to gods of the firſt order. In the Roman mythology, it is the name of a ſtone which Saturn ſwallowed, by the contrivance of his wife Ops, believing it to be his new-born ſon Jupiter: hence it ridiculouſly became the object of religious worſhip.

ABÆ, or Aba, (anc. geog.) a town of Phocis in Greece, near Helicon; famous for an oracle of Apollo older than that at Delphi, and for a rich temple plundered and burnt by the Perſians.

ABAFT, a ſea-term, ſignifying the hinder part of a ſhip, or all thoſe parts both within and without which lie towards the ſtern, in oppoſition to afore; which ſee.—*Abaft*, is alſo uſed as a prepoſition, and ſignifies *further aft*, or *nearer the ſtern*; as, the barricade ſtands *abaft* the main-maſt, *i. e.* behind it, or nearer the ſtern.

ABAISSED, *Abaiſſe*, in heraldry, an epithet applied to the wings of eagles, &c. when the tip looks downwards to the point of the ſhield, or when the wings are ſhut, the natural way of bearing them being extended.

ABAKA khan, the 18th emperor of the Moguls, a wiſe and clement prince. He reigned 17 years, and is by ſome authors ſaid to have been a Chriſtian. It may be admitted, indeed, that he joined with the Chriſtians in keeping the feaſt of Eaſter, in the city Hanadau, ſome ſhort time before his death. But this is no proof of his Chriſtianity; it being common, in times of brotherly love, for Chriſtians and Mahometans to join in keeping the ſame feaſts, when each would compliment the other with doing honour to his ſolemnity.

ABALAK, a town of Siberia, two miles from Tobolſk. E. Long. 64. 10. N. Lat. 57. 1.

ABALIENATION, in law, the act of transferring one man's property to another.

ABALLABA, the ancient name of Appleby, a town in Weſtmoreland, remarkable only for its antiquity, having been a Roman ſtation. W. Long. 1. 4. N. Lat. 55. 38.

ABALUS (anc. geog.), ſuppoſed by the ancients to be an iſland in the German ocean, called by Timæus *Baſilia*, and by Xenophon Lampſacenus *Baltia*; now the peninſula of Scandinavia. Here, according to Pliny, ſome imagined that amber dropped from the trees.

ABANA, or Amana (anc. geog.), a river of Phœnicia, which, riſing from Mount Hermon, waſhed the ſouth and weſt ſides of Damaſcus, and falls into the Phœnician ſea to the north of Tripolis, called *Chryſorrheas* by the Greeks.

ABANGA. See Ady.

ABANO, a town of the Paduano, in the republic of Venice, famous among the ancients for its hot baths.

ABANTES, a people who came originally from Thrace, and ſettled in Phoceca, a country of Greece, where they built a town which they called Aba, after the name of Abas their leader; and, if we may credit ſome ancient authors, the Abantes went afterwards into the iſland Eubœa, now called Negropont: others ſay the Abantes of Eubœa came from Athens. The Abantes were a very warlike people, cloſing with their enemies, and fighting hand to hand.

ABANTIAS, or Abantis (anc. geog.), a name of the iſland Eubœa in the Egean ſea, extending along the coaſt of Greece, from the promontory Sunium of Attica to Theſſaly, and ſeparated from Bœotia by a narrow ſtrait called *Euripus*. From its length the iſland was formerly called *Macris*; afterwards *Abantias*, or *Abantis*, from the Abantes, a people originally of Thrace, called by Homer οπισθεν Κομοωντες, from wearing their hair long behind, having in a battle experienced the inconvenience of wearing long hair before. From cutting their hair before, they were called *Curetes*.

ABAPTISTON, in ſurgery, the perforating part of the inſtrument called a TREPAN.

ABARA, a town in the Greater Armenia, under the dominion of the Turks: it is often the reſidence of the archbiſhop of Nakſivan. Long. 46. 25. Lat. 39. 45.

ABARANER, a town of Aſia, in Grand Armenia, belonging to the Turks: it is ſeated on the river Alingena. Long. 46. 30. Lat. 39. 50.

ABARCA, an ancient kind of ſhoe uſed in Spain for paſſing the mountains with. It was made of raw hides, and bound with cords, which ſecured the feet of travellers againſt the ſnow.

ABARIM, high mountains of ſteep aſcent, ſeparating the country of the Ammonites and Moabites from the land of Canaan, where Moſes died. According to Joſephus, they ſtood oppoſite to the territory of Jericho, and were the laſt ſtation but one of the Iſraelites coming from Egypt. Nebah and Piſgah were parts of theſe mountains.

ABARIS, the Hyperborean; a celebrated ſage of antiquity, whoſe hiſtory and travels have been the ſubject of much learned diſcuſſion. Such a number of fabulous ſtories * were told of him, that Herodotus himſelf ſeems to ſcruple to relate them. He tells us only†, that this Barbarian was ſaid to have travelled with an arrow, and to have taken no ſuſtenance: but this does not acquaint us with the marvellous properties which were attributed to that arrow; nor that it had been given him by the Hyperborean Apollo. With regard to the occaſion of his leaving his native country, Harpocration‡ tells us, that the whole earth being infeſted with a deadly plague, Apollo, upon being conſulted, gave no other anſwer, than that the Athenians ſhould offer up prayers in behalf of all other nations: upon which, ſeveral countries deputed ambaſſadors to Athens, among whom was Abaris the Hyperborean. In this journey, he renewed the alliance between his countrymen and the inhabitants of the iſland of Delos. It appears that he alſo went to Lacedæmon; ſince, according to ſome writers ||, he there built a temple conſecrated to Proſerpine the Salutary. It is aſſerted, that he was capable of foretelling earthquakes, driving away plagues, laying ſtorms‡, &c. He wrote ſeveral books, as Suidas† informs us, *viz.* Apollo's arrival into the country of the Hyperboreans; The nuptials of the river Hebrus; Θεογονια, or the Generation of the Gods; A collection of oracles; &c. Himerius the ſophiſt applauds him for ſpeaking pure Greek; which attainment will be no matter of wonder to ſuch as conſider the ancient intercourſe there was between the Greeks and Hyperboreans.—If the Hebrides, or Weſtern Iſlands of Scotland, (ſays Mr Toland*), were the Hyperboreans of Diodorus†, then the celebrated Abaris was of that country; and likewiſe a druid, having been the prieſt of Apollo. Suidas, who knew not the diſtinction of the inſular Hyperboreans, makes him a Scythian; as do ſome others, miſled by the ſame vulgar error; though Diodorus has truly fixed his country in an iſland, and not on the continent. Indeed the fictions and miſtakes concerning our Abaris are infinite: however, it is by all agreed that he travelled quite over Greece, and from thence into Italy, where he converſed familiarly with Pythagoras, who favoured him beyond all his diſciples, by inſtructing him in his doctrines (eſpecially his thoughts of nature) in a plainer and more compendious method than he did any other. This diſtinction could not but be very advantageous to Abaris. The Hyperborean, in return, preſented the Samian, as though he equalled Apollo himſelf in wiſdom, with the ſacred arrow, on which the Greeks have fabulouſly related‡ that he ſat aſtride, and flew upon it, through the air, over rivers and lakes, foreſts and mountains; in like manner as our vulgar ſtill believe, particularly thoſe of the Hebrides, that wizards and witches fly whitherſoever they pleaſe on their broomſticks. The orator Himerius above mentioned, though one of thoſe who, from the equivocal ſenſe of the word Hyperborean, ſeem to have miſtaken Abaris for a Scythian, yet deſcribes his perſon accurately, and gives him a very noble character. "They relate (ſays he) "that Abaris the ſage was by nation an Hyperborean, "appeared a Grecian in ſpeech, and reſembled a Scythian in his habit and appearance. He came to "Athens, holding a bow in his hand, having a quiver "hanging on his ſhoulders, his body wrapt up in a "plaid, girt about the loins with a gilded belt, and "wearing trowſers reaching from his waiſt downward." By this it is evident (continues Mr Toland) that he was not habited like the Scythians, who were always covered with ſkins; but appeared in the native garb of an Aboriginal Scot. As to what relates to his abilities, Himerius informs us, that "he was affable and "pleaſant in converſation, in diſpatching great affairs "ſecret and induſtrious, quick-ſighted in preſent exigencies, in preventing future dangers circumſpect, "a ſearcher after wiſdom, deſirous of friendſhip, truſting little to fortune, and having every thing truſted "him for his prudence." Neither the Academy nor the Lycæum could have furniſhed a man with fitter qualities to travel ſo far abroad, and to ſuch wiſe nations,

* Jamblich. Vita Pythag.
† Lib. iv. cap. 36.
‡ Under the word 'Αβαρις.
|| Pauſanias, lib. iii. p. 94.
‡ Porphyry in *Vita Pythagor.*
† Under the word 'Αβαρις.
* Account of the Druids, in his *Poſthumous Works*, vol. i. p. 161.
† Diod. Sic. lib. ii, iii.
‡ Jamblichi *Vita Pythag.* p. 128.

nations, about affairs no lefs arduous than important. And if we further attentively confider his moderation in eating, drinking, and the ufe of all thofe things which our natural appetites inceffantly crave; joining the candour and fimplicity of his manners with the folidity and wifdom of his anfwers, all which we find fufficiently attefted; it muft be owned, that the world at that time had few to compare with Abaris.

ABARTICULATION, in anatomy, a fpecies of articulation admitting of a manifeft motion; called alfo Diarthrofis, and Dearticulatio, to diftinguifh it from that fort of articulation which admits of a very obfcure motion, and is called Synarthrofis.

ABAS, a weight ufed in Perfia for weighing pearls. It is 1-8th lefs than the European carat.

Abas, in the heathen mythology, was the fon of Hypothoon and Meganira, who entertained Ceres, and offered a facrifice to that goddefs; but Abas ridiculing the ceremony, and giving her opprobrious language, fhe fprinkled him with a certain mixture fhe held in her cup, on which he became a newt or water-lizard.

Abas (Schah) the Great, was third fon of Codabendi, 7th king of Perfia, of the race of the Sophis. Succeeding to his father at 18, in 1585, he found the affairs of Perfia at a low ebb, occafioned by the conquefts of the Turks and Tartars. He regained feveral of the provinces they had feized; but death put a ftop to his victories in 1629, after a reign of 44 years. He was the greateft prince that had reigned in Perfia for many ages; and it was he who made Ifpahan the metropolis of Perfia: his memory is held in the higheft veneration among the Perfians.

Abas (Schah) his grandfon, 9th king of Perfia, of the race of the Sophis, fucceeded his father Sefi at 13 years of age: he was but 18 when he made himfelf mafter of the city Candahar, which had furrendered in his father's reign to the Great Mogul, and all the province about it; and he preferved it afterwards againft this Indian emperor, though he befieged it more than once with an army of 300,000 men. He was a very merciful prince, and openly protected the Chriftians: he had formed a defign of extending the limits of his kingdom toward the north, and had for that effect levied a powerful army; but death put a ftop to all his great defigns, at 37 years of age, in 1666.

ABASCIA, or Abcas, a country in Afia, tributary to the Turks, fituated on the coaft of the Black Sea. The people are poor, thievifh, and treacherous, infomuch that there is no trading with them without the utmoft caution. Their commodities are furs, buck and tyger fkins, linen yarn, boxwood, and bees-wax: but their greateft traffic is in felling their own children, and even one another, to the Turks; infomuch that they live in perpetual diftruft. They are deftitute of many neceffaries of life, and have nothing among them that can be called a town; though we find Anacopia, Dandar, and Czekorni, mentioned in the maps. They have the name of Chriftians; but have nothing left but the name, any more than the Mingrelians their northern neighbours. The men are robuft and active, and the women are fair and beautiful; on which account the Turks have a great value for the female flaves which they purchafe from among them. Their cuftoms are much the fame as thofe of the Mingrelians; which fee. E. Long. from 39. to 43. Lat. from 43 to 45.

ABASCUS, a river of Afiatic Sarmatia, which, rifing from Mount Caucafus, falls into the Euxine, between Pityus to the eaft, and Nofis to the weft.

ABASITIS (anc. geog.), a tract of Afiatic Myfia, in which was fituated the city of Ancyra.

ABASSI, or Abassis, a filver coin current in Perfia, equivalent in value to a French livre, or tenpence halfpenny Sterling. It took its name from Schah Abas II. king of Perfia, under whom it was ftruck.

ABASSUS (anc. geog.), a town of the Greater Phrygia, on the confines of the Toliftobagii, a people of Galatia in Afia.

ABATAMENTUM, in law, is an entry to lands by interpofition, *i. e.* when a perfon dies feized, and another who has no right enters before the heir.

To ABATE, (from the French *abbatre*, to pull down, overthrow, demolifh, batter down, or deftroy), a term ufed by the writers of the Englifh common-law both in an active and neutral fenfe; as, To abate a caftle, is to beat it down. To abate a writ, is, by fome exception, to defeat or overthrow it. A ftranger abateth; that is, entereth upon a houfe or land void by the death of him that laft poffeffed it, before the heir takes poffeffion, and fo keepeth him out: wherefore, as he that putteth out him in poffeffion is faid to diffeize, fo he that fteppeth in between the former poffeffor and his heir is faid to abate. In the neuter fignification thus: The writ of the demandant fhall abate; that is, fhall be difabled, fruftrated, or overthrown. The appeal abateth by covin; that is, the accufation is defeated by deceit.

Abate, in the manege, implies the performing any downward motion properly. Thus a horfe is faid to abate or take down his curvets, when he puts both his hind legs to the ground at once, and obferves the fame exactnefs in all the times.

ABATELEMENT, in commerce, a term ufed for a prohibition of trade to all French merchants in the ports of the Levant who will not ftand to their bargains, or refufe to pay their debts. It is a fentence of the French conful, which muft be taken off before they can fue any perfon for the payment of their debts.

ABATEMENT, in heraldry, an accidental figure fuppofed to have been added to coats of arms, in order to denote fome difhonourable demeanour or ftain, whereby the dignity of coat-armour was rendered of lefs efteem. See Heraldry.

Abatement, in law. See *To* Abate.

Abatement, in the cuftoms, an allowance made upon the duty of goods, when the quantum damaged is determined by the judgment of two merchants upon oath, and afcertained by a certificate from the furveyor and land-waiter.

ABATIS, an ancient term for an officer of the ftables.

ABATON, an erection at Rhodes, as a fence to the trophy of Artemifia, queen of Halicarnaffus, Coos, &c. raifed in memory of her victory over the Rhodians; or rather as a fcreen to conceal the difgrace of the Rhodians from the eyes of the world, the effacing or deftroying the trophy being with them a point of religion.

ABATOR, in law, a term applied to a perfon who enters to a houfe or lands void by the death of the laft poffeffor, before the true heir.

ABATOS (anc. geog.), an ifland in the lake Moeris,

formerly famous for its papyrus. It was the burial-place of Ofiris.

ABAVO, in botany, a fynonime of the ADANSONIA.

ABB, a term, among clothiers, applied to the yam of a weaver's warp. They fay alfo *Abb-wool* in the fame fenfe.

ABBA (anc. geog.) a town of Afric Propria, near Carthage.

ABBA, in the Syriac and Chaldee languages, literally fignifies *a father;* and, figuratively, a fuperior, reputed as a father in refpect of age, dignity, or affection. It is more particularly ufed in the Syriac, Coptic, and Ethiopic churches, as a title given to the bifhops. The bifhops themfelves beftow the title *Abba* more eminently on the bifhop of Alexandria; which occafioned the people to give him the title of *Baba*, or *Papa*, that is, *Grandfather;* a title which he bore before the bifhop of Rome. It is a Jewifh title of honour given to certain rabbins called *Tanaites;* and it is alfo particularly ufed, by fome writers of the middle age, for the fuperior of a monaftery, ufually called ABBOT.

ABBADIE (James), an eminent Proteftant divine, born at Nay in Bern in 1654; firft educated there under the famous John la Placette, and afterward at the univerfity of Sedan. From thence he went into Holland and Germany, and was minifter in the French church of Berlin. He left that place in 1690; came into England; was fome time minifter in the French church in the Savoy, London; and was made dean of Killalow in Ireland. He died at St Mary le Bonne near London, in 1727, aged 73. He was ftrongly attached to the caufe of king William, as appears in his elaborate defence of the revolution, and his hiftory of the affaffination-plot. He had great natural abilities, which he improved by true and ufeful learning. He was a moft zealous defender of the primitive doctrine of the Proteftants, as appears by his writings; and that ftrong nervous eloquence, for which he was fo remarkable, enabled him to enforce the doctrines of his profeffion from the pulpit with great fpirit and energy. He publifhed feveral works in French that were much efteemed; the principal of which are, A Treatife on the Truth of the Chriftian Religion; The art of Knowing one's Self; A Defence of the Britifh Nation; The Deity of Jefus Chrift effential to the Chriftian Religion; The Hiftory of the laft Confpiracy in England, written by order of king William III.; and The Triumph of Providence and Religion, or the opening the Seven Seals by the Son of God.

ABBAS, fon of Abdalmothleb, and Mahomet's uncle, oppofed his nephew with all his power, efteeming him an impoftor and infidel; but in the fecond year of the hegira, being overcome and made a prifoner at the battle of Bendir in 623, a great ranfom being demanded for him, he reprefented to Mahomet, that his paying it would reduce him to poverty, which would redound to the difhonour of the family. But Mahomet having been informed of Abbas's having fecreted large fums of money, afked him after the purfes of gold he had left in his mother's cuftody at Mecca. Abbas, upon this, conceiving him to be really a prophet, embraced his new religion; became one of his principal captains; and faved his life when in imminent danger at the battle of Henain, againft the Thakefites, foon after the reduction of Mecca. But befides being a great commander, Abbas was a famous doctor of the Muffulman law, infomuch that he read lectures upon every chapter of the Koran, as his nephew pretended to receive them one by one from heaven. He died in 652, and his memory is held in the higheft veneration among the Muffulmans to this day.

Abul ABBAS, furnamed *Saffah*, was proclaimed khalif; and in him began the Dynafty of the

ABBASSIDES, who poffeffed the khalifate for 524 years; and there were 37 khalifs of this race who fucceeded one another without interruption.

ABBE, in a monaftic fenfe, the fame with ABBOT.

ABBE, in a modern fenfe, is the name of a curious popular character in France, very much mentioned, but very little known, in Britain. The term is not to be rendered in our language, as the exiftence of the being which it denominates is pofterior to the reformation, and no fuch character was known among the Romanifts till about a century and a half ago.

Abbés, according to the ftricteft definition, are perfons who have not yet obtained any precife or fixed fettlement in church or ftate, but moft heartily wifh for, and would aceept of, either, juft as it may happen. In the mean while, their privileges are many. They are admiffible in all companies, and no degradation to the beft, notwithftanding they are fometimes found in the worft. Their drefs is rather that of an academic, or of a profeffed fcholar, than of an ecclefiaftic; and, never varying in colour, is no encumbrance on the pocket.

Thefe abbés are very numerous, and no lefs ufeful. They are, in colleges, the inftructors of youth; in private families, the tutors of young gentlemen; and many procure a decent livelihood by their literary and witty compofitions of all kinds, from the profoundeft philofophy to the moft airy romances. They are, in fhort, a body of men who poffefs a fund of univerfal talents and learning, and are inceffantly employed in the cultivation of every various branch of literature and ingenuity. No fubject whatever efcapes them; ferious or gay, folid or ludicrous, facred or profane, all pay tribute to their refearches; and as they are converfant in the loweft as well as the higheft topics, their fame is equally great in the learned and in the fcribbling world.—A diftinguifhing part of their character, too, though we fhall but flightly touch it, is their devotion to the fair fex: whofe favourites, in return, they have the honour of being in the moft enviable degree; the wit and fmartnefs for which they are ufually remarkable, being juft the very thing that fuit the French ladies.—In fine, thefe abbés are fought after by moft people, on various accounts; as they are equally men of bufinefs and pleafure, not lefs expert in the moft ferious tranfactions, than fond of enjoying their fhare in whatever occupies the gay world. Hence they diligently frequent all public fpectacles, which are thought incomplete without them; as they compofe the moft intelligent part of the company, and are the moft weighty approvers or condemners of what paffes in almoft all places.

ABBESS, the fuperior of an abbey or convent of nuns. The abbefs has the fame rights and authority over her nuns that the abbots regular have over their monks. The fex indeed does not allow her to perform the fpiritual functions annexed to the priefthood, wherewith the abbot is ufually invefted; but there are inftances of fome abbeffes who have a right or rather a privilege,

to

to commiffion a prieft to act for them. They have even a kind of epifcopal jurifdiction, as well as fome abbots who are exempted from the vifitation of their diocefans.

Martene, in his treatife on the rights of the Church, obferves, that fome abbeffes have formerly confeffed their nuns. But he adds, that their exceffive curiofity carried them fuch lengths, that there arofe a neceffity of checking it. However, St Bafil, in his Rule, allows the abbefs to be prefent with the prieft at the confeffion of her nuns.

ABBEVILLE, a confiderable city of France in Picardy, and the capital of Ponthieu; the river Somme runs through the middle of it, and divides it into two parts. It has a collegiate church and twelve parifh-churches; the moft confiderable of which are St George's and St Giles's, befides a great number of monafteries and nunneries, a bailiwic, and a prefidial court. It is a fortified town; the walls are flanked with baftions, and furrounded by large ditches; and was never yet taken; from which circumftance it is fometimes called the *Maiden Town*. The country about it is low, marfhy, and dirty. It is pretty well peopled, and is famous for its woollen manufactory. The cloths and ftuffs made there are faid to be now little inferior to thofe of England and Holland. The work, however, is affifted by the clandeftine importation of Englifh and Irifh wool, and workmen from this country. It is about fifteen miles eaft of the Britifh channel, and fhips may come from thence by the river Somme to the middle of the town. E. Long. 2. 6. Lat. 50. 7.

ABBEY, a monaftery, or religious houfe, governed by a fuperior under the title of *abbot* or *abbefs*.

Abbeys differ from *priories*, in that the former are under the direction of an abbot, and the others of a prior: but abbot and prior (we mean a prior conventual) are much the fame thing, differing in little but the name.

Fauchet obferves, that, in the early days of the French monarchy, dukes and counts were called *abbots*, and duchies and counties *abbeys*. Even fome of their kings are mentioned in hiftory under the title of *abbots*. Philip I. Louis VI. and afterwards the dukes of Orleans, are called *abbots of the monaftery of St Aignan*. The dukes of Aquitain were called *abbots of the monaftery of St Hilary, at Poictiers;* and the earls of Anjou, of *St Aubin*, &c.

Monafteries were at firft nothing more than religious houfes, whither perfons retired from the buftle of the world to fpend their time in folitude and devotion. But they foon degenerated from their original inftitution, and procured large privileges, exemptions, and riches. They prevailed greatly in Britain before the reformation; particularly in England: and as they increafed in riches, fo the ftate became poor; for the lands, which thefe regulars poffeffed were *in mortua manu*, i. e. could never revert to the lords who gave them. This inconvenience gave rife to the ftatutes againft gifts in *mortmaine*, which prohibited donations to thefe religious houfes: and Lord Coke tells us, that feveral lords, at their creation, had a claufe in their grant, that the donor might give or fell his land to whom he would (*exceptis viris religiofis & Judæis*) excepting monks and Jews.

Thefe places were wholly abolifhed in England at the time of the Reformation; Henry VIII. having firft appointed vifitors to infpect into the lives of the monks and nuns, which were found in fome places very diforderly: upon which, the abbots, perceiving their diffolution unavoidable, were induced to refign their houfes to the king, who by that means became invefted with the abbey-lands: thefe were afterwards granted to different perfons, whofe defcendents enjoy them at this day: they were then valued at 2,853,000 *l.* per annum, an immenfe fum in thofe days.

Though the fuppreffion of religious houfes, even confidered in a political light only, was of a very great national benefit, it muft be owned, that, at the time they flourifhed, they were not entirely ufelefs. Abbeys or monafteries were then the repofitories, as well as the feminaries, of learning; many valuable books and national records, as well as private evidences, have been preferved in their libraries; the only places wherein they could have been fafely lodged in thofe turbulent times. Many of thofe, which had efcaped the ravages of the Danes, were deftroyed with more than Gothic barbarity at the diffolution of the abbeys. Thefe ravages are pathetically lamented by John Bale, in his Declaration upon Leland's Journal 1549. "Covetoufnefs," fays he, "was at that time fo bufy about private commodity, that public wealth, in that moft neceffary and of refpect, was not any where regarded. A number of them which purchafed thefe fuperftitious manfions, referved of the library-books, fome to ferve their jacks, fome to fcour the candlefticks, and fome to rub their boots; fome they fold to the grocer and foap-feller; and fome they fent over fea to the book-binders, not in fmall numbers, but in whole fhips full; yea, the univerfities of this realm are not clear of fo deteftable a fact. I know a merchant that bought the contents of two noble libraries for 40s. price; a fhame it is to be fpoken! This ftuff hath he occupied inftead of gray paper, by the fpace of more than thefe ten years, and yet he hath ftore enough for as many years to come. I fhall judge this to be true, and utter it with heavinefs, that neither the Britons under the Romans and Saxons, nor yet the Englifh people under the Danes and Normans, had ever fuch damage of their learned monuments as we have feen in our time."

In thefe days every abbey had at leaft one perfon whofe office it was to inftruct youth; and the hiftorians of this country are chiefly beholden to the monks for the knowledge they have of former national events. In thefe houfes alfo the arts of painting, architecture, and printing, were cultivated. The religious houfes alfo were hofpitals for the fick and poor; affording likewife entertainment to travellers at a time when there were no inns. In them the nobility and gentry who were heirs to their founders could provide for a certain number of ancient and faithful fervants, by procuring them corodies, or ftated allowances of meal, drink, and clothes. They were likewife an afylum for aged and indigent perfons of good family. The neighbouring places were alfo greatly benefited by the fairs procured for them, and by their exemption from foreft-laws; add to which, that the monaftic eftates were generally let at very eafy rents, the fines given at renewals included.

ABBEYBOYLE, a town of Ireland, in the county of Rofcommon, and province of Connaught. W. Long. 8. 32. Lat. 56. 54. It is remarkable for an old abbey.

ABBEYHOLM, a town in Cumberland; ſo called from an abbey built there by David king of Scots. It ſtands on an arm of the ſea. W. Long. 2. 38. Lat. 54. 45.

ABBOT, or Abbat, the ſuperior of a monaſtery of monks erected into an abbey or prelacy.

The name *Abbot* is originally Hebrew, where it ſignifies father. The Jews call *father*, in their language, *Ab;* whence the Chaldeans and Syrians formed *Abba;* thence the Greeks Αββας, which the Latins retained, *Abbas;* and hence our *Abbot*, the French *Abbé*, &c. —St Mark and St Paul uſe the Syriac *Abba* in their Greek, by reaſon it was then commonly known in the ſynagogues and the primitive aſſemblies of the Chriſtians; adding to it, by way of interpretation, the word *father*, Αββα ο πατηρ, "Abba, father;" *q. d.* Abba, that is to ſay, Father.—But the name Ab, or Abba, which at firſt was a term of tenderneſs and affection in the Hebrew and Chaldee, became at length a title of dignity and honour: The Jewiſh doctors affected it; and one of their moſt ancient books, containing the ſayings or apophthegms of divers of them, is intitled Pirke *Abboth*, or Avoth; *i. e.* Chapters of the Fathers. It was in alluſion to this affectation, that Jeſus Chriſt forbad his diſciples to call any man their father on earth; which word St Jerome turns againſt the ſuperiors of the monaſteries of his time, for aſſuming the title of *Abbots*, or Fathers.

The name *Abbot*, then, appears as old as the inſtitution of monks itſelf.—The governors of the primitive monaſteries aſſumed indifferently the titles *Abbots*, and *Archimandrites**. They were really diſtinguiſhed from the clergy; though frequently confounded with them, becauſe a degree above laymen.

* See *Monk* and *Archimandrite.*

In thoſe early days, the abbots were ſubject to the biſhops and the ordinary paſtors. Their monaſteries being remote from cities, built in the fartheſt ſolitudes, they had no ſhare in eccleſiaſtical affairs. They went on Sundays to the pariſh-church with the reſt of the people; or, if they were too remote, a prieſt was ſent them to adminiſter the ſacraments; till at length they were allowed to have prieſts of their own body. The abbot or archimandrite himſelf was uſually the prieſt: but his function extended no farther than to the ſpiritual aſſiſtance of his monaſtery; and he remained ſtill in obedience to the biſhop. There being among the abbots ſeveral perſons of learning, they made a vigorous oppoſition to the riſing hereſies of thoſe times; which firſt occaſioned the biſhops to call them out of their deſarts, and fix them about the ſuburbs of cities, and at length in the cities themſelves: from which æra their degeneracy is to be dated. The abbots, now, ſoon wore off their former plainneſs and ſimplicity, and began to be looked on as a ſort of little prelates. They aſpired at being independent of the biſhops; and became ſo inſupportable, that ſome ſevere laws were made againſt them at the council of Chalcedon; this notwithſtanding, in time many of them carried the point of independency, and got the appellation of *lord*, with other badges of the epiſcopate, particularly the mitre.

Hence aroſe new ſpecies of diſtinctions between the abbots. Thoſe were termed *mitred* abbots, who were privileged to wear the mitre, and exerciſe epiſcopal authority within their reſpective precincts, being exempted from the juriſdiction of the biſhop. Others were called *croſiered* abbots, from their bearing the croſier or paſtoral ſtaff. Others were ſtyled *œcumenical* or univerſal abbots, in imitation of the patriarch of Conſtantinople: while others were termed *cardinal* abbots, from their ſuperiority over all other abbots.—Among us, the mitred abbots were lords of parliament; and called abbots-ſovereign, and abbots-general, to diſtinguiſh them from the other abbots. And as there were lords abbots, ſo there were alſo lords priors, who had exempt juriſdiction, and were likewiſe lords of Parliament. Some reckon 26 of theſe lords abbots and priors that ſat in parliament. Sir Edward Coke ſays, that there were 27 parliamentary abbots and two priors. In the parliament 20 Rich. II. there were but 25 abbots and two priors: but in the ſummons to parliament *anno* 4 Ed. III. more are named.

At preſent, in the Roman-catholic countries, the principal diſtinctions obſerved between abbots are thoſe of *regular* and *commendatory*. The former take the vow and wear the habit of their order; whereas the latter are ſeculars, though they are obliged by their bulls to take orders when of proper age.

Anciently the ceremony of creating an abbot conſiſted in clothing him with the habit called *cuculus*, or cowl; putting the paſtoral ſtaff into his hand, and the ſhoes called *pedales* on his feet; but at preſent, it is only a ſimple benediction, improperly called, by ſome, conſecration.

Abbot is alſo a title given to others beſide the ſuperiors of monaſteries: thus biſhops, whoſe ſees were formerly abbeys, are called abbots; as are the ſuperiors of ſome congregations of regular canons, particularly that of St Geneviéve at Paris: and among the Genoeſe, the chief magiſtrate of their republic formerly bore the title of Abbot of the people. It was likewiſe uſual, about the time of Charlemagne, for ſeveral lords to aſſume the title of *count-abbots*, *abba comites;* and that for no other reaſon, but becauſe the ſuperintendancy of certain abbeys was committed to them.

ABBOT (George), archbiſhop of Canterbury, was born Oct. 29. 1562, at Guildford in Surrey. He went through his ſtudies at Oxford, and in 1597 was choſen principal of Univerſity College. In 1599, he was inſtalled dean of Wincheſter: the year following, he was choſen vice-chancellor of the univerſity of Oxford, and a ſecond time in 1603. In 1604, that tranſlation of the bible now in uſe was begun by the direction of king James; and Dr Abbot was the ſecond of eight divines of Oxford, to whom the care of tranſlating the whole New Teſtament (excepting the epiſtles) was committed. The year following, he was a third time vice-chancellor. In 1608, he went to Scotland with George Hume Earl of Dunbar, to aſſiſt in eſtabliſhing an union betwixt the kirk of Scotland and the church of England; and in this affair he behaved* with ſo much addreſs and moderation, that it laid the foundation of all his future preferment. For king James ever after paid great deference to his advice and counſel; and upon the death of Dr Overton biſhop of Litchfield and Coventry, he named Dr Abbot for his ſucceſſor, who was accordingly conſtituted biſhop of thoſe two united ſees in December 1609. About a month afterwards he was tranſlated to the ſee of London, and on the ſecond of November thereafter was raiſed to the archiepiſcopal ſee.

* Heylin's hiſt. of Preſbyterians, p. 83.

Abbot.

It is not however improbable, that his extravagant adulation of his royal maſter, in which he went as far as any other court-chaplain could do, contributed not a little to the acceleration of his preferment. In the preface to a pamphlet he publiſhed, the following ſpecimen of ridiculous flattery occurs: Speaking of the king, he ſays, " whoſe life hath been ſo immaculate and unſpotted, &c. that even malice itſelf, which leaves nothing unſearched, could never find true blemiſh in it, nor caſt probable aſperſion on it.—Zealous as David; learned and wiſe, the *Solomon* of our age; religious as Joſias; careful of ſpreading Chriſt's faith as Conſtantine the Great; juſt as Moſes; undefiled in all his ways as a Jehoſaphat and Hezekias; full of clemency as another Theodoſius."—If Mr Walpole had ſeen this paſſage, he certainly would not have ſaid, that " honeſt Abbot could not flatter."

His great zeal for the Proteſtant religion made him a ſtrenuous promoter of the match between the Elector Palatine and the Princeſs Elizabeth; which was accordingly concluded and ſolemnized the 14th of February 1612, the archbiſhop performing the ceremony on a ſtage erected in the royal chapel. In the following year happened the famous caſe of divorce betwixt the lady Francis Howard, daughter of the earl of Suffolk, and Robert earl of Eſſex: an affair which has been by many conſidered as one of the greateſt blemiſhes of king James's reign; but the part acted therein by the archbiſhop added much to the reputation he had already acquired for incorruptible integrity. The matter was by the king referred to a court of delegates. The archbiſhop ſaw plainly, that his Majeſty was very deſirous the lady ſhould be divorced; but he was, in his own judgment, directly againſt the divorce. He laboured all he could to extricate himſelf from this difficulty, by having an end put to the cauſe by ſome other way than by ſentence: but it was to no purpoſe; for thoſe who drove on this affair, had got too great power to be reſtrained from bringing it to the concluſion the king deſired. The archbiſhop prepared a ſpeech, which he intended to have ſpoken againſt the nullity of the marriage, in the court at Lambeth; but he did not make uſe of it, becauſe the king ordered the opinions to be given in few words. He continued, however, inflexible in his opinion againſt the divorce; and drew up his reaſons, which the king thought fit to anſwer himſelf. It need ſcarce be added, that ſentence was given in the lady's favour. In 1618, the king publiſhed a declaration, which he ordered to be read in all churches, permitting ſports and paſtimes on the Lord's day: this gave great uneaſineſs to the archbiſhop; who, happening to be at Croydon when it came thither, had the courage to forbid its being read.

Being now in a declining ſtate of health, the archbiſhop uſed in the ſummer to go to Hampſhire for the ſake of recreation; and being invited by lord Zouch to hunt in his park at Bramzill, he met there with the greateſt misfortune that ever befel him; for he accidentally killed the game-keeper by an arrow from a croſs-bow which he ſhot at one of the deer. This accident threw him into a deep melancholy; and he ever afterwards kept a monthly faſt on Tueſday, the day on which this fatal miſchance happened, and he ſettled an annuity of 20*l.* on the widow*. There were ſeveral perſons who took an advantage of this misfortune, to leſſen him in the king's favour; but his Majeſty ſaid, " An angel might have miſcarried in this ſort." His enemies alleging that he had incurred an irregularity, and was thereby incapacitated for performing the offices of a primate; the king directed a commiſſion to ten perſons to inquire into this matter.

* Fuller's church-hiſt. cent. xvii. p. 87.

The reſult, however, was not ſatisfactory to his Grace's enemies; it being declared, that, as the murder was involuntary, he had not forfeited his archiepiſcopal character. The archbiſhop thenceforward ſeldom aſſiſted at the council, being chiefly hindered by his infirmities; but in the king's laſt illneſs he was ſent for, and attended with great conſtancy till his Majeſty expired on the 27th of March 1625. He performed the ceremony of the coronation of king Charles I. though very infirm and much troubled with the gout. He was never greatly in this king's favour; and the duke of Buckingham being his declared enemy, watched an opportunity of making him feel the weight of his diſpleaſure. This he at laſt accompliſhed, upon the archbiſhop's refuſing to licenſe a ſermon, preached by Dr Sibthorpe to juſtify a loan which the king had demanded, and pregnant with principles which tended to overthrow the conſtitution. The archbiſhop was immediately after ſuſpended from all his functions as primate; and they were exerciſed by certain biſhops commiſſioned by the king, of whom Laud, the archbiſhop's enemy, and afterwards his ſucceſſor, was one: while the only cauſe aſſigned for this procedure was, That the archbiſhop could not at that time perſonally attend thoſe ſervices which were otherwiſe proper for his cogniſance and direction. He did not, however, remain long in this ſituation; for a parliament being abſolutely neceſſary, his Grace was ſent for, and reſtored to his authority and juriſdiction. But not proving friendly to certain rigorous meaſures adopted by the prevailing church-party, headed by Laud, whoſe power and intereſt at court were now very conſiderable, his preſence became unwelcome there; ſo that upon the birth of the Prince of Wales, afterwards Charles II. Laud had the honour to baptize him, as dean of the chapel. The archbiſhop being worn out with cares and infirmities, died at Croydon, the 5th of Auguſt 1633, aged 71 years; and was buried at Guilford, the place of his nativity, and where he had endowed an hoſpital with lands to the amount of 300*l.* per annum. A ſtately monument was erected over the grave, with the effigy of the archbiſhop in his robes.

He ſhewed himſelf, in moſt circumſtances of his life, a man of great moderation to all parties; and was deſirous that the clergy ſhould attract the eſteem of the laity by the ſanctity of their manners, rather than claim it as due to their function. His notions and principles, however, not ſuiting the humour of ſome writers, have drawn upon him many ſevere reflections; particularly, which is to be regretted, from the earl of Clarendon. But Dr Welwood has done more juſtice to his merit and abilities*. He wrote ſeveral tracts upon various ſubjects; and, as already mentioned, tranſlated part of the New Teſtament, with the reſt of the Oxford divines, 1611.

* Memoirs, 8vo, 1700, p. 38.

It is proper to obſerve here, that there was another writer of both his names, who flouriſhed ſomewhat later. This George Abbot wrote *A paraphraſe on*

L

Job,

Job, *A vindication of the ſabbath*, and *A paraphraſe on the Pſalms*.

ABBOT (Robert), elder brother to the former, and born at Guildford in 1560, went through his ſtudies in Baliol college, Oxford. In 1582, he took his degree of maſter of arts, and ſoon became a celebrated preacher; and to this talent he chiefly owed his preferment. Upon his firſt ſermon at Worceſter, he was choſen lecturer in that city, and ſoon after rector of All-ſaints in the ſame place. John Stanhope, Eſq; happening to hear him preach at Paul's-croſs, was ſo pleaſed with him, that he immediately preſented him to the rich living of Bingham in Nottinghamſhire. In 1597, he took his degree of doctor in divinity: and, in the beginning of king James's reign, was appointed chaplain in ordinary to his Majeſty; who had ſuch an opinion of him as a writer, that he ordered the doctor's book *De Antichriſto* to be printed with his own commentary upon part of the Apocalypſe. In 1609, he was elected maſter of Baliol college; which truſt he diſcharged with the utmoſt care and aſſiduity, by his frequent lectures to the ſcholars, by his continual preſence at public exerciſes, and by promoting temperance in the ſociety. In November 1610, he was made prebendary of Normanton in the church of Southwell; and, in 1612, his Majeſty appointed him regius profeſſor of divinity at Oxford. The fame of his lectures became very great; and thoſe which he gave upon the ſupreme power of kings againſt Bellarmine and Suarez, ſo much pleaſed his Majeſty, that, when the ſee of Saliſbury became vacant, he named him to that biſhoprick, and he was conſecrated by his own brother at Lambeth, December 3, 1615. When he came to Saliſbury, he found the cathedral running to decay, through the negligence and covetouſneſs of the clergy belonging to it: however, he found means to draw five hundred pounds from the prebendaries, which he applied to the reparation of this church. He then gave himſelf up to the duties of his function with great diligence and aſſiduity, viſiting his whole dioceſe in perſon, and preaching every Sunday whilſt health would permit. But this was not long: for his ſedentary life, and cloſe application to ſtudy, brought upon him the gravel and ſtone; of which he died on the 2d of March 1618, in the fifty-eighth year of his age; having not filled the ſee quite two years and three months, and being one of the five biſhops which Saliſbury had in ſix years. He was buried oppoſite to the biſhop's ſeat in the cathedral. Dr Fuller*, ſpeaking of the two brothers, ſays, "that George was the more "plauſible preacher, Robert the greateſt ſcholar; "George the abler ſtateſmen, Robert the deeper di-"vine; gravity did frown in George, and ſmile in "Robert." He publiſhed ſeveral pieces; he alſo left behind him ſundry manuſcripts, which Dr Corbet made a preſent of to the Bodelian library.

* *Worthies of England in Surrey.*

ABBOTSBROMLEY, a town in Staffordſhire, with a market on Tueſday. After the diſſolution of the monaſteries, it was given to the Lord Paget; and has ſince been called *Paget's Bromley*, and is ſo denominated in the county map. But it retains its old name in the king's books, and is a diſcharged vicarage of 30 l. clear yearly value. It likewiſe retains the old name with regard to the fairs. W. Long. 1. 2. Lat. 52. 45.

ABBOTSBURY, a ſmall town in Dorſetſhire, with a market on Thurſday. W. Long. 1. 17. Lat. 50. 40. The abbey near this town was founded by a Norman lady, about the year 1026; and Edward the Confeſſor and William the Conqueror were conſiderable benefactors to it.

ABBREVIATE *of* ADJUDICATIONS, in Scots law, an abſtract or abridgment of a decreet of adjudication, which is recorded in a regiſter kept for that purpoſe.

ABBREVIATION, or ABBREVIATURE, a contraction of a word or paſſage; made by dropping ſome of the letters, or by ſubſtituting certain marks or characters in their place.—Lawyers, phyſicians, &c. uſe abundance of abbreviations, partly for the ſake of expedition, and partly for that of myſtery; but of all people the Rabbins are the moſt remarkable for this practice, ſo that their writings are unintelligible without the Hebrew abbreviatures. The Jewiſh authors and copyiſts do not content themſelves with abbreviating words like the Greeks and Latins, by retrenching ſome of the letters or ſyllables; they frequently take away all but the initial letters. They even frequently take the initials of ſeveral ſucceeding words, join them together, and, adding vowels to them, make a ſort of barbarous word, repreſentative of all thoſe which they have thus abridged. Thus, Rabbi Moſes ben Maiemen, in their abbreviature is *Rambam*, &c.

ABBREVIATOR, in a general ſenſe, a perſon who abridges any large book into a narrower compaſs.

ABBREVIATORS, a college of 72 perſons in the chancery of Rome, who draw up the pope's brieves, and reduce petitions, when granted by him, into proper form for being converted in bulls.

ABBUTALS, ſignify the buttings or boundings of land towards any point. Limits were anciently diſtinguiſhed by artificial hillocks, which were called *botemines;* and hence *butting*. In a deſcription of the ſite of land, the ſides on the breadth are more properly *adjacentes*, and thoſe terminating the length are *abbutantes;* which, in old ſurveys, were ſometimes expreſſed by *capitare*, to head, whence abbutals are now called *head-lands*.

ABCEDARY, or ABCEDARIAN, an epithet given to compoſitions, the parts of which are diſpoſed in the order of the letters of the alphabet: thus we ſay, Abcedarian pſalms, lamentations, hymns, &c.

ABCOURT, a town near St Germains, four leagues from Paris. Here is a briſk chalybeate water, impregnated with fixed air and the foſſil alkali; and reſembling the waters of Spa and Ilmington.

ABDALLA, the ſon of Abdalmothleb, was the father of the prophet Mahomet. Several other Arabians of eminence bore the ſame name.

ABDALMALEK, the ſon of Mirvan, and the 5th khalif of the race of the Ommiades, ſurnamed *Raſch al Hegianat*, *i. e.* the ſkinner of a ſtone, becauſe of his extreme avarice; as alſo *Aboulzebab*, becauſe his breath was ſaid to be ſo poiſonous as to kill all the flies which reſted on his face. Yet he ſurpaſſed all his predeceſſors in power and dominion; for in his reign the Indies were conquered in the eaſt, and his armies penetrated Spain in the weſt: he likewiſe extended his empire toward the ſouth, by making himſelf maſter of Medina and Mecca. He began his reign in the 65th of the hegira, A. D. 648; reigned 15 years; and four of his ſons enjoyed the khalifate one after another.

Abdalmelek (Ben Zohar), an eminent phyſician, commonly called by the Europeans *Avenzoar*. See Avenzoar.

ABDALMOTHLEB, or Abdal Mateleb, the ſon of Haſhem, the father of Abdalla, and grandfather of Mahomet the prophet of the Muſſulmans, was, it is ſaid, of ſuch wonderful comelineſs and beauty, that all women who ſaw him became enamoured: which may have given occaſion to that prophetic light, which, according to the Arabians, ſhone on the foreheads of him, his anceſtors, and deſcendants; it being certain that they were very handſome and graceful men. He died when Mahomet, of whom he had taken peculiar care, was only 8 or 9 years old; aged, according to ſome, 110, and according to other writers 120.

ABDALONYMUS, or Abdolonymus, (in claſſic hiſtory), of the royal family of Sidon, and deſcended from king Cinyras, was contented to live in obſcurity, and get his ſubſiſtence by cultivating a garden, while Strato was in poſſeſſion of the crown of Sidon. Alexander the Great having depoſed Strato, inquired whether any of the race of Cinyras was living, that he might ſet him on the throne. It was generally thought that the whole race was extinct: but at laſt Abdalonymus was thought of, and mentioned to Alexander; who immediately ordered ſome of his ſoldiers to fetch him. They found the good man at work, happy in his poverty, and entirely a ſtranger to the noiſe of arms, with which all Aſia was at that time diſturbed; and they could ſcarcely perſuade him that they were in earneſt. Alexander was convinced of his high deſcent by the dignity that appeared in his perſon; but was deſirous of learning from him in what manner he bore his poverty. "I wiſh" ſaid Abdalonymus, "I may bear my new condition as well: Theſe hands have ſupplied my neceſſities: I have had nothing, and I have wanted nothing." This anſwer pleaſed Alexander ſo much, that, beſides giving him all that was Strato's, he augmented his dominions, and gave him a large preſent out of the Perſian ſpoils.

ABDALS, in the Eaſtern countries, a kind of ſaints ſuppoſed to be inſpired to a degree of madneſs. The word comes, perhaps, from the Arabic, *Abdallah*, the ſervant of God. The Perſians call them *devaneh khoda*, ſimilar to the Latins way of ſpeaking of their prophets and ſibyls, *q. d. furentes deo*, raging with the god. They are often carried by exceſs of zeal, eſpecially in the Indies, to run about the ſtreets, and kill all they meet of a different religion; of which travellers furniſh many inſtances. The Engliſh call this, *running a muk*, from the name of the inſtrument, a ſort of poniard, which they employ on thoſe deſperate occaſions. If they are killed, as it commonly happens, before they have done much miſchief, they reckon it highly meritorious; and are eſteemed, by the vulgar, martyrs for their faith.

ABDARA, or Abdera, (anc. geog.) a town of Bœotia in Spain, a Phœnician colony; now *Adra*, to the weſt of Almeira in the kingdom of Granada.

ABDERA, (anc. geog.) a maritime town of Thrace, not far from the mouth of the river Neſſus, on the eaſt ſide. The foundation, according to Herodotus, was attempted to be laid by Timeſius the Clazomenian; but he was forced by the Thracians to quit the deſign. The Teians undertook it, and ſucceeded; ſettling there, in order to avoid the inſults of the Perſians.

—Several ſingularities are told of Abdera *. The graſs of the country round it was ſo ſtrong, that ſuch horſes as eat of it ran mad. In the reign of Caſſander king of Macedon, this city was ſo peſtered with frogs and rats, that the inhabitants were forced to quit it for a time.—The Abderites, or Abderitani, were very much derided for their want of wit and judgment: yet their city has given birth to ſeveral eminent perſons; as, Protagoras, Democritus, Anaxarchus, Hecatæus the hiſtorian, Nicenætus the poet, and many others, who were mentioned among the illuſtrious men.—In the reign of Lyſimachus, Abdera was afflicted for ſome months with a moſt extraordinary diſeaſe †: this was a burning fever, whoſe criſis was always on the ſeventh day, and then it left them; but it ſo diſtracted their imaginations, that they fancied themſelves players. After this, they were ever repeating verſes from ſome tragedy, and particularly out of the Andromeda of Euripides, as if they had been upon the ſtage; ſo that many of theſe pale, meagre actors, were pouring forth their tragic exclamations in every ſtreet. This delirium continued till the winter following; which was a very cold one, and therefore fitter to remove it. Lucian, who has deſcribed this diſeaſe, endeavours to account for it in this manner: Archelaus, an excellent player, acted the Andromeda of Euripides before the Abderites, in the height of a very hot ſummer. Several had a fever at their coming out of the theatre; and as their imaginations were full of the tragedy, the delirium which the fever raiſed repreſented perpetually Andromeda, Perſeus, Meduſa, &c. and the ſeveral dramatic incidents, and called up the ideas of thoſe objects, and the pleaſure of the repreſentation, ſo ſtrongly, that they could not forbear imitating Archelaus's action and declamation: And from theſe the fever ſpread to others by infection.

ABDERAHMA, a Saracen viceroy in Spain, who revolted, and formed an independent principality at Cordova. He had ſeveral ſucceſſors of the ſame name.

ABDEST, a Perſian word, properly ſignifying the water placed in a baſon for waſhing the hands; but is uſed to imply the legal purifications practiſed by the Mahometans before they enter on their religious ceremonies.

ABDIAS of Babylon, one of the boldeſt legend-writers, who boaſted he had ſeen our Saviour, that he was one of the 72 diſciples, had been eye-witneſs of the actions and prayers at the deaths of ſeveral of the apoſtles, and had followed into Perſia St Simon and St Jude, who, he ſaid, made him the firſt biſhop of Babylon. His book intitled *Hiſtoria certaminis apoſtolici*, was publiſhed by Wolfgang Lazius, at Baſil, 1551; and it has ſince borne ſeveral impreſſions in different places.

ABDICATION, the action whereby a magiſtrate, or perſon in office, renounces and gives up the ſame before the term of ſervice is expired.

This word is frequently confounded with *reſignation*; but differs from it, in that abdication is done purely and ſimply, whereas reſignation is in favour of ſome third perſon. It is ſaid to be a renunciation, quitting, and relinquiſhing, ſo as to have nothing further to do with a thing; or the doing of ſuch actions as are inconſiſtent with the holding of it. On king James's leaving the kingdom, and abdicating the government, the

* Plinii, lib. xxv. c. 8. Juſt. lib. xv. c. 2.

† Lucianus *quomodo Hiſt. ſit conſcribendus, initio.*

lords would have had the word *defertion* made ufe of; but the commons thought it was not comprehenfive enough, for that the king might then have liberty of returning.—Among the Roman writers it is more particularly ufed for the act whereby a father difcarded or difclaimed his fon, and expelled him the family. It is diftinguifhed from *exhæredatio* or *difinheriting*, in that the former was done in the father's lifetime; the latter, by will at his death: fo that whoever was abdicated, was alfo difinherited; but not *vice verfa*.

ABDOMEN, in anatomy, is that part of the trunk of the body which lies between the thorax and the bottom of the pelvis. See ANATOMY.

ABDOMINALES, or ABDOMINAL FISHES, conftitute the IVth Order of the *Fourth Clafs* of Animals, in the Linnæan fyftem. See ZOOLOGY.

ABDUCTION, in logic, a kind of argumentation, by the Greeks called *apagoge*, wherein the greater extreme is evidently contained in the medium, but the medium not fo evidently in the leffer extreme as not to require fome farther medium or proof to make it appear. It is called *abduction*, becaufe, from the conclufion, it draws us on to prove the propofition affumed. Thus, in the fyllogifm, "All whom God abfolves are free from fin; but God abfolves all who are in Chrift; therefore all who are in Chrift are free from fin,"—the major is evident; but the minor, or affumption, is not fo evident without fome other propofition to prove it, as, "God received full fatisfaction for fin by the fufferings of Jefus Chrift."

ABDUCTION, in furgery, a fpecies of fracture, wherein the broken parts of the bone recede from each other.

ABDUCTOR, or ABDUCENT, in anatomy, a name given to feveral of the mufcles, on account of their ferving to withdraw, open, or pull back the parts to which they belong.

ABEL, fecond fon of Adam and Eve, was a fhepherd. He offered to God fome of the firftlings of his flock, at the fame time that his brother Cain offered the fruits of the earth. God was pleafed with Abel's oblation, but difpleafed with Cain's; which fo exafperated the latter, that he rofe up againft his brother and killed him. Thefe are the only circumftances Mofes relates of him; though, were we to take notice of the feveral particulars to which curiofity has given birth on this occafion, they would run to a very great length. But this will not be expected. It is remarkable, that the Greek churches, who celebrate the feafts of every other patriarch and prophet, have not done the fame honour to Abel. His name is not to be found in any catalogue of faints or martyrs till the 10th century; nor even in the new Roman martyrology. However he is prayed to, with fome other faints, in feveral Roman litanies faid for perfons who lie at the point of death.

ABEL Keramim, or *Vincarum*, beyond Jordan, in the county of the Ammonites, where Jephthah defeated them, feven miles diftant from Philadelphia, abounding in vines, and hence the name. It was alfo called *Abela*.

ABEL-Mehola, the country of the prophet Elifha, fituate on this fide Jordan, between the valley of Jezreel and the village Bethmaela in the plains of Jordan, where the Midianites were defeated by Gideon. Judges, vii. 22.

ABEL-Mizraim, called alfo the Threfhing-floor of Atad; fignifying the lamentation of the Egyptians; in allufion to the mourning for Jacob, Gen. i. 3, 10, 11. Suppofed to be near Hebron.

ABEL-Mofch, or *Abelmufch*, in botany, the trivial name of a fpecies of the HIBISCUS.

ABEL-Sattim, or *Sittim*, a town in the plains of Moab, to the N. E. of the Dead Sea, not far from Jordan, where the Ifraelites committed fornication with the daughters of Moab: So called, probably, from the great number of fittim-trees there.

ABELARD (Peter), one of the moft famous doctors of the twelfth century, was born at Palais near Nantz, in Britany: he was well learned in divinity, philofophy, and the languages; but was particularly diftinguifhed by his fkill in logic, and his fondnefs for difputations, which led him to travel into feveral provinces in order to give public proof of his acutenefs in that fcience.

After having baffled many antagonifts, he read lectures in divinity with great applaufe at Paris; where he boarded with a canon whofe name was Fulbert, and who had a very beautiful niece named Heloife. The canon ardently wifhed to fee this young lady make a figure among the learned, and Abelard was made her preceptor: but inftead of inftructing her in the fciences, he taught her to love. Abelard now performed his public functions very coldly, and wrote nothing but amorous verfes. Heloife proving with child, Abelard fent her to a fifter of his in Britany, where fhe was delivered of a fon. To foften the canon's anger, he offered to marry Heloife privately; and the old man was better pleafed with the propofal than the niece; who, from a fingular excefs of paffion, chofe to be Abelard's miftrefs rather than his wife. She married, however; but ufed often to proteft upon oath that fhe was fingle, which provoked the canon to ufe her ill. Upon this, Abelard fent her to the monaftery of Argenteuil; where fhe put on a religious habit, but did not take the veil. Heloife's relations confidering this as a fecond treachery, hired ruffians, who, forcing into his chamber in the dead of the night, emafculated him. This infamous treatment made him fly to the gloom of a cloifter. He affumed the monaftic habit in the abbey of St Dennis; but the diforders of that houfe foon drove him from thence. He was afterwards charged with herefy; but after feveral perfecutions for his religious fentiments, he fettled in a folitude in the diocefe of Troies, where he built an oratory, to which he gave the name of the Paraclet. He was afterwards chofen fuperior of the abbey of Ruis in the diocefe of Vannes: when the nuns being expelled from the nunnery in which Heloife had been placed, he gave her his oratory; where fhe fettled with fome of her fifter nuns, and became their priorefs.

Abelard mixed the philofophy of Ariftotle with his divinity, and in 1140 was condemned by the council of Rheims and Sens. Pope Innocent II. ordered him to be imprifoned, his books to be burnt, and forbid him ever teaching again. However, he was foon after pardoned, at the folicitation of Peter the Venerable, who received him into his abbey of Clugni, where he led an exemplary life. He died in the priory of Marcellus at Chalons, April 21, 1142, aged fixty-three. His corpfe was fent to Heloife, who buried it in the Paraclet. He left feveral works: the moft celebrated of which are

are those tender letters that passed between him and Heloise, with the account of their misfortunes prefixed; which have been translated into English, and immortalised by the harmony of Mr Pope's numbers.

ABEL-TREE, or ABELE-TREE, an obsolete name for a species of the poplar. See POPULUS.

ABELIANS, ABEOLITES, or ABELONIANS, in church-history, a sect of heretics mentioned by St Austin, which arose in the diocese of Hippo in Africa, and is supposed to have begun in the reign of Arcadius, and ended in that of Theodosius. Indeed it was not calculated for being of any long continuance. Those of this sect regulated marriage after the example of Abel; who, they pretended, was married, but died without ever having known his wife. They therefore allowed each man to marry one woman, but enjoined them to live in continence: and, to keep up the sect, when a man and woman entered into this society, they adopted a boy and a girl, who were to inherit their goods, and to marry upon the same terms of not begetting children, but of adopting two of different sexes.

ABELLA, anciently a town of Campania, near the river Clanius. The inhabitants were called Abellani, and said to have been a colony of Chalcidians. The nux Avellana, called also Prænestina, or the hazelnut, takes its name from this town, according to Macrobius. Now *Avella*.

ABELLINUM, anciently a town of the Hirpini, a people of Apulia; distant about a mile from the rivulet Sabbato, between Beneventum and Salernum. Pliny calls the inhabitants Abellinates, with the epithet Protopi, to distinguish them from the Abellinates Marsi. Now *Avellino*. E. Long. 15. 20. Lat. 21.

ABEN EZRA (Abraham), a celebrated rabbi, born at Toledo in Spain, called by the Jews, The wise, great, and admirable Doctor, was a very able interpreter of the Holy Scriptures; and was well skilled in grammar, poetry, philosophy, astronomy, and medicine. He was also a perfect master of the Arabic. His principal work is, Commentaries on the Old Testament, which is much esteemed: these are printed in Bomberg's and Buxtorf's Hebrew Bibles. His style is clear, elegant, concise, and much like that of the Holy Scriptures: he almost always adheres to the literal sense, and every where gives proofs of his genius and good sense: he, however, advances some erroneous sentiments. The scarcest of all his books is intitled, Jesud Mora; which is a theological work, intended as an exhortation to the study of the Talmud. He died in 1174, aged 75.

ABEN Meller, a learned rabbin, who wrote a commentary on the Old Testament in Hebrew, intitled The Perfection of Beauty. This rabbin generally follows the grammatical sense and the opinions of Kimchi. The best edition is that of Holland.

ABENAS, a town of France, in Languedoc and in the lower Vivarais, seated on the river Ardesch, at the foot of the Cevennes. E. Long. 4. 43. Lat. 44. 40.

ABENEL GAUBY, a fixed star of the second or third magnitude, on the south scale of the constellation LIBRA.

ABENSPERG, a small town of Germany, in the circle and duchy of Bavaria, and in the government of Munich. It is seated on the river Abentz, near the Danube. E. Long. 11. 38. Lat. 48. 45.

ABERAVON, a borough-town of Glamorganshire in Wales, governed by a portreeve. It had a market, which is now discontinued: the vicarage is discharged, and is worth 45l. clear yearly value. It is seated at the mouth of the river Avon, 194 miles west of London. W. Long. 3. 21. Lat. 51. 40.

ABERBROTHICK, or ARBROATH, one of the royal boroughs of Scotland, situated in the county of Angus, about forty miles N. N. E. of Edinburgh; its W. Long. being 2. 29. and N. Lat. 56. 36. It is seated on the discharge of the little river Brothic into the sea, as the name imports, *Aber* in the British implying such a situation. It is a small but flourishing place, well built, and still increasing. The town has been in an improving state for the forty last years, and the number of inhabitants greatly augmented; which is owing to the introduction of manufactures. The numbers at this time, is said to be about four thousand: these principally consist of weavers of coarse brown linens, and some sail-cloth; others are employed in making white and coloured threads: the remainder are either engaged in the shipping of the place, or in the necessary and common mechanic trades. The brown linens, or Osnaburghs, were manufactured here before any encouragement was given by Government, or the linen company erected at Edinburgh. It appears from the books of the stamp-office in this town, that seven or eight hundred thousand yards are annually made in the place, and a small district round. Besides this export and that of thread, much barley and some wheat is sent abroad. The foreign imports are flax, flax-seed, and timber, from the Baltic. The coasting trade consists of coals from Borrowstounness, and lime from Lord Elgin's kilns in Fife.—At this place, in default of a natural harbour, a tolerable artificial one of piers has been formed, where, at spring-tides, which rise here fifteen feet, ships of two hundred tons can come, and of eighty at neap-tides; but they must lie dry at low water. This port is of great antiquity: there is an agreement yet extant between the abbot and the burghers of Aberbrothic, in 1194, concerning the making of the harbour. Both parties were bound to contribute their proportions; but the largest fell to the share of the former, for which he was to receive an annual tax payable out of every rood of land lying within the borough.—The glory of this place was the abbey, whose very ruins give some idea of its former magnificence. It was founded by William the Lion in 1178, and dedicated to our celebrated primate Thomas à Becket. The founder was buried here; but there are no remains of his tomb, or of any other, excepting that of a monk of the name of Alexander Nicol. The monks were of the Tyronensian order; and were first brought from Kelso, whose abbot declared those of this place, on the first institution, to be free from his jurisdiction. The last abbot was the famous Cardinal Beaton, at the same time archbishop of St Andrew's, and, before his death, as great and absolute here as Wolsey was in England. King John, the English monarch, granted this monastery most uncommon privileges; for, by charter under his great seal, he exempted it *a teloniis et consuetudine* in every part of England, except London. At Aberbrothic is a chalybeate water, similar to those of Peterhead and Glendy.

Abercornway, Aberdeen.

ABERCONWAY, or CONWAY, Caernarvonſhire, North-Wales; ſo called from its ſituation at the mouth of the river Conway. It is a handſome town, pleaſantly ſituated on the ſide of a hill, and has many conveniences for trade; notwithſtanding which it is the pooreſt town in the county. It was built by Edward I. and had not only walls, but a ſtrong caſtle which is now in ruins. Here is an inſcription on the tomb of one Nicholas Hooks, importing that he was the one-and-fortieth child of his father, and had twenty-ſeven children himſelf. It is 229 miles from London, W. Long. 3. 47. N. Lat. 53. 20.

ABERDEEN, the name of two cities in Scotland, called the *Old* and *New Towns*, ſituated on the German ocean, in W. Long. 1. 40. and N. Lat. 57. 19.

Aberdeen is a place of great antiquity. According to tradition, it was of note in the reign of Gregory, who conferred on it ſome privileges about the year 893. In 1004, Malcolm II. founded a biſhoprick at a place called Mortlich in Banffſhire, in memory of a ſignal victory which he there gained over the Danes: which biſhoprick was tranſlated to Old Aberdeen by David I.; and in 1163, the then biſhop of Aberdeen obtained a new charter from Malcolm IV. There is extant a charter of Alexander II. by which, in 1217, the King grants to Aberdeen the ſame privileges he had granted to his town of Perth.

The Old Town lies about a mile to the north of the new, at the mouth of the river Don, over which is a fine Gothic bridge, of a ſingle arch, greatly admired, which reſts at both ſides on two rocks. This arch, ſaid to have been built by a biſhop of Aberdeen about the year 1290, is 67 feet wide at the bottom, and 34½ feet high above the ſurface of the river, which at ebb-tide is here 19 feet deep. The old town was formerly the ſeat of the biſhop, and had a large cathedral commonly called *St Macher's*. Two very antique ſpires, and one aiſle, which is uſed as a church, are now the only remains of it. The biſhoprick was founded in the time of David I. as above mentioned. The cathedral had anciently two rows of ſtone pillars acroſs the church, and three turrets; the ſteeple, which was the largeſt of theſe turrets, reſted upon an arch, ſupported by four pillars. In this cathedral there was a fine library; but, about the year 1560, it was almoſt totally deſtroyed. But the capital building is the King's-college, on the ſouth ſide of the town, which is a large and ſtately fabric. It is built round a ſquare, with cloiſters on the ſouth ſide. The chapel is very ruinous within; but there ſtill remains ſome wood-work of exquiſite workmanſhip. This was preſerved by the ſpirit of the principal at the time of the reformation, who armed his people and checked the blind zeal of the barons of the Mearns; who, after ſtripping the cathedral of its roof, and robbing it of the bells, were going to violate this ſeat of learning. They ſhipped their ſacrilegious booty, with an intention of expoſing it to ſale in Holland: but the veſſel had ſcarcely gone out of port, when it periſhed in a ſtorm with all its ill-gained lading. The ſteeple is vaulted with a double croſs arch; above which is an imperial crown, ſupported by eight ſtone-pillars, and cloſed with a globe and two gilded croſſes. In the year 1631 this ſteeple was thrown down by a ſtorm, but was ſoon after rebuilt in a more ſtately form. This college was founded in 1494, by William Elphinſton biſhop of this place, Lord Chancellor of Scotland in the reign of James III. and Lord Privy Seal in that of James IV. But James IV. claimed the patronage of it, and it has ſince been called the *King's College*. This college, and the Mariſchal-college in the New Town, form one univerſity, called the *Univerſity of King Charles*. The library is large, but not remarkable for many curioſities. Hector Boethius was the firſt principal of the college; and ſent for from Paris for that purpoſe, on an annual ſalary of forty marks Scots, at thirteen pence each. The ſquare tower on the ſide of the college was built by contributions from General Monk and the officers under him then quartered at Aberdeen, for the reception of ſtudents; of which there are about a hundred belonging to the college who lie in it.

Aberdeen.

The New Town is the capital of the ſhire of Aberdeen. For largeneſs, trade, and beauty, it greatly exceeds any town in the north of Scotland. It is built on a hill or riſing ground, and lies on a ſmall bay formed by the Dee, deep enough for a ſhip of 200 tons, and above two miles in circumference.—The buildings (which are of granite from the neighbouring quarries) are generally four ſtories high; and have, for the moſt part, gardens behind them, which gives it a beautiful appearance. On the high-ſtreet is a large church, which formerly belonged to the Franciſcans. This church was begun by Biſhop William Elphinſton; and finiſhed by Gavinus Dunbar, biſhop of Aberdeen, about the 1500. Biſhop Dunbar is ſaid likewiſe to have built the bridge over the Dee, which conſiſts of ſeven arches. In the middle of Caſtle-ſtreet is an octagon building, with neat bas-relievos of the kings of Scotland from James I. to James VII. The town-houſe makes a good figure, and has a handſome ſpire in the centre, The grammar-ſchool is a low but neat building. Gordon's hoſpital is handſome; in front is a good ſtatue of the founder: it maintains forty boys, who are apprenticed at proper ages. The infirmary is a large plain building, and ſends out between eight and nine hundred cured patients annually, But the chief public building in the new town is the Mariſchal-college, founded by George Keith earl of Mariſchal, in the year 1593; but ſince greatly augmented with additional buildings. There are about 140 ſtudents belonging to it. In both the Mariſchal and King's-college the languages, mathematics, natural philoſophy, divinity, &c. are taught by very able profeſſors. The convents in Aberdeen were: One of Mathurines, or of the order of the Trinity, founded by William the Lion, who died in 1214; another of Dominicans, by Alexander II.; a third of Obſervantines, a building of great length in the middle of the city, founded by the citizens and Mr Richard Vans, &c.; and a fourth of Carmelites, or White Friars, founded by Philip de Arbuthnot in 1350.

Aberdeen, including the Old Town, is ſuppoſed to contain 25,000 people. Its trade is conſiderable, but might be greatly extended by an attention to the white fiſheries.

The harbour was long a great detriment to its trade, and occaſioned the loſs of many lives and much property. A ſtranger could never depend upon finding it as he left it; while veſſels lay at anchor in the road till the tide ſhould make, they have often been wrecked by ſtorms

ftorms which fuddenly arofe. It was very narrow at the mouth, having the eafterly rocky point of the Grampian mountains on the fouth, and a flat blowing fand on the north, extending along the coaft for many miles. By the eafterly and north-eaft ftorms the fand was driven in a long ridge acrofs the harbour's mouth, and formed what was called the *bar*. Upon this bar the depth of water at low tide was fometimes not above three feet. Clearing away the fand, though but a partial and temporary remedy, was a matter of great expence to the community: If it was cleared one week fo as to have five or fix feet of water at ebb, a frefh ftorm the next week undid all that had been done. The town at laft came to the refolution of erecting a ftrong pier on the north fide of the harbour. This pier is 1200 feet in length, and gradually increafes in thicknefs and height as it approaches to the fea, where the head or rounding is 60 feet diameter at the bafe, and the perpendicular elevation is 38 feet. The whole is built of granite, the moft durable ftone known: many of the outfide ftones are above three tons weight, with hewn beds. It was built under the direction of Mr Smeaton; and the expence, amounting to above 17,000l., is defrayed by doubling the harbour-dues, which are chiefly paid by the inhabitants.

A little to the fouth of the bar, they have now a depth of 17 fathoms at low water; and at the harbour mouth, from eight to nine fathoms, where they had formerly but a few feet.

Aberdeen once enjoyed a good fhare of the tobacco trade. At prefent, its imports are from the Baltic, and a few merchants trade to the Weft Indies and North America. Its exports are ftockings, thread, falmon, and oatmeal. The firft is a moft important article, as appears by the following ftate of it. For this manufacture, 20,800 pounds worth of wool is annually imported, and 1600 pounds worth of oil. Of this wool are annually made 69,333 dozen pairs of ftockings; worth, at an average, 1l. 10s. *per* dozen. Thefe are the work of the country-people in almoft all parts of this great county, who get 4s. *per* dozen for fpinning, and 14s. *per* dozen for knitting; fo that there is annually paid them 62,329l. 14s. There is, befides, about 2000l. value of ftockings manufactured from the wool of the county. The thread manufacture is another confiderable article, though trifling in comparifon of the woolen. The falmon fifheries on the Dee and the Don are a good branch of trade. About 46 boats, and 130 men, are employed on the firft; and, in fome years, 167,000 ℔. of fifh have been fent pickled to London, and about 930 barrels of falted fifh exported to France, Italy, &c.—The fifhery on the Don is far lefs confiderable. The fifh of this river are taken in cruives above the bridge; a practice contrary to the ancient laws of the kingdom, unlefs where the nature of the water rendered the net-fifhery impracticable. The inhabitants likewife export confiderable quantities of pickled pork, which they fell to the Dutch for victualling their Eaft India fhips and men of war; the Aberdeen pork having the reputation of being the beft cured of any in Europe for keeping on long voyages.

"It is however remarkable, (Mr Knox obferves), that there is not a fingle decked veffel fitted out from Aberdeen for the herring or white fifheries: here is now an excellent harbour; an active people, converfant in trade, and poffeffed of capital; feated within fix hours failing of Long Fortys, and two days failing of the Shetland Ifles. This inattention is the more extraordinary, as the exports of Aberdeen, though very confiderable, do not balance the imports in value. The herring and white fifheries, therefore, if profecuted with vigour, cured and dried with judgment, would not only extend the fcale of exports, but alfo furnifh the outward bound veffels with freights, and better affortments for the foreign markets. The falmon of the Dee and Don are taken in great abundance, cured in the higheft perfection, and greatly valued at the European markets. If the merchants, in addition to thefe, fhould alfo export the cargoes of 50 or 60 veffels conftantly employed in the herring and white fifheries, the port of Aberdeen would in a few years become the moft celebrated mart of fifh now exifting."

From a round hill at the weft end of the city, flow two fprings, one of pure water and the other of a quality refembling the German Spa. Aberdeen, with Aberbrothick, Brechin, Montrofe, and Inverbervie, returns one member to Parliament.

ABERDEENSHIRE, comprehends the diftricts of Mar, Garioch, Strathbogie, and the greater part of Buchan; and fends one member to Parliament. It is wafhed on the eaft and north by the ocean; and abounds in fea-ports, from whence there is a fafe and ready paffage to the Orkneys and Shetland Ifles, the Greenland fifheries, Norway, and the regions round the Baltic, the German coaft, Holland, Flanders, France. It is watered by numerous ftreams, all of them the refort of falmon, and whofe banks difplay the moft extenfive plantations as well as natural woods in Britain.

ABERDOUR, a fmall town in Fifefhire, Scotland, on the frith of Forth, about ten miles N. W. of Edinburgh. In old times it belonged to the Viponts; in 1126 it was transferred to the Mortimers by marriage, and afterwards to the Douglafes. William, lord of Liddefdale, furnamed the *Flower of chivalry*, in the reign of David II. by charter conveyed it to James Douglas, anceftor of the prefent noble owner the Earl of Morton. The monks of Inchcolm had a grant for a burial-place here from Allan de Mortimer, in the reign of Alexander III. The nuns, ufually ftyled the poor *Clares*, had a convent at this place.

ABERFORD, a market-town in the weft riding of Yorkfhire, ftands in a bottom; and is about a mile long, and indifferently well built. It is near a Roman road, which is raifed very high, and not far from the river Cock; between which and the town there is the foundation of an old caftle ftill vifible. It is 181 miles north-by-weft from London. W. Long. 2. 45. Lat. 55. 52.

ABERGAVENNY, a large, populous, and flourifhing town in Monmouthfhire, feated at the confluence of the rivers Ufk and Gavenny. It has a fine bridge over the Ufk, confifting of fifteen arches; and being a great thoroughfare from the weft part of Wales to Bath, Briftol, Gloucefter, and other places, is well furnifhed with accommodations for travellers. It is furrounded with a wall, and had once a caftle. It carries on a confiderable trade in flannels, which are brought hither for fale from the other parts of the county.

county. It is 142 miles distant from London. W. Long. 2. 45. Lat. 51. 50. Abergavenny appears to have been the *Gibbanium* of Antoninus, and the town of Usk his *Burrium*.

ABERNETHY (John), an eminent dissenting minister, was the son of Mr John Abernethy a dissenting minister in Colraine, and was born on the 19th of October 1680. When about nine years of age, he was separated from his parents, his father being obliged to attend some public affairs in London; and his mother, to shelter herself from the mad fury of the Irish rebels, retiring to Derry, a relation who had him under his care, having no opportunity of conveying him to her, took him with him to Scotland; by which means he escaped the hardships he must have suffered at the siege of Derry, where Mrs Abernethy lost all her other children. He afterwards studied at the university of Glasgow, till he took the degree of master of arts; and, in 1708, he was chosen minister of a dissenting congregation at Antrim, where he continued above twenty years. About the time of the Bangorian controversy (for which, see HOADLEY), a dissension arose among his brethren in the ministry at Belfast, on the subject of subscription to the Westminster confession; in which he became a leader on the negative side, and incurred the censure of a general synod. Being in consequence deserted by the greatest part of his congregation, he accepted an invitation to settle in Dublin, where his preaching was much admired. He was distinguished by his candid, free, and generous sentiments; and died of the gout in Dec. 1740, in the sixtieth year of his age. He published a volume of sermons on the Divine Attributes; after his death a second volume was published by his friends; and these were succeeded by four other volumes on different subjects: all of which have been greatly admired.

ABERNETHY, a town in Strathern, a district of Perthshire in Scotland. It is seated on the river Tay, a little above the mouth of the Erne. It is said to have been the seat of the Pictish kings; and was afterwards the see of an archbishop, since transferred to St Andrews. It is now greatly decayed.

ABERRATION, in astronomy, a small apparent motion of the fixed stars discovered by the late Dr Bradley. The discovery was made by accident in the year 1725, when Mr Molyneux and Dr Bradley began to observe the bright star in the head of *Draco*, marked γ by Bayer, as it passed near the zenith, with an instrument made by Mr Graham, in order to discover the parallax of the earth's annual orbit; and, after repeated observations, they found this star, about the beginning of March 1726, to be 20″ more southerly than at the time of the first observation. It now indeed seemed to have arrived at its utmost limit southward; because, in several trials made about this time, no sensible difference was observed in its situation. By the middle of April, it appeared to be returning back again toward the north; and, about the beginning of June, it passed at the same distance from the zenith as it had done in December, when it was first observed: in September following, it appeared 39″ more northerly than it was in March, just the contrary way to what it ought to appear by the annual parallax of the stars. This unexpected phenomenon perplexed the observers very much; and Mr Molyneux died before the true cause of it was discovered. After this, Dr Bradley, with another instrument more exact and accurately adapted to this purpose, observed the same appearances not only in that but many other stars: and, by the great regularity that appeared in a series of observations made in all parts of the year, the Doctor was fully satisfied with regard to the general laws of the phenomena; and therefore endeavoured to find out the cause of them. He was already convinced, that the apparent motion of the stars was not owing to a nutation of the earth's axis. The next thing that offered itself, was an alteration in the direction of the plumb line, with which the instrument was constantly rectified; but this, upon trial, proved insufficient. Then he had recourse to what refraction might do; but here also nothing satisfactory occurred. At last this acute astronomer found, that the phenomena in question proceeded from the progressive motion of light, and the earth's annual motion in its orbit: for he perceived, that if light was propogated in time, the apparent place of a fixed object would not be the same when the eye is at rest, as when it is moving in any other direction, than that of the line passing through the eye and object; and that, when the eye is moving in different directions, the apparent place of the object would be different.

ABERRATION, in optics, is used to denote that error or deviation of the rays of light, when inflected by a lens or speculum, whereby they are hindered from meeting or uniting in the same point. There are two species of the aberrations of rays, distinguished by their different causes; one arising from the figure of the glass or speculum, the other from the unequal refrangibility of the rays of light. This last species is sometimes called the Newtonian, from the name of its discoverer. See OPTICS, n° 17. 136. 173.

ABERYSWITH, a market-town of Cardiganshire, in Wales, seated on the Ridal, near its confluence with the Istwith, where it falls into the sea. It is a populous, rich town, and has a great trade in lead, and a considerable fishery of whiting, cod, and herrings. It was formerly surrounded with walls, and fortified with a castle; but both are now in ruins. Its distance from London is 199 miles west-south-west. W. Long. 4. 15. Lat. 52. 30.

ABESTA, the name of one of the sacred books of the Persian magi, which they ascribe to their great founder Zoroaster. The abesta is a commentary on two others of their religious books called *Zend* and *Pazend;* the three together including the whole system of the Ignicold, or worshippers of fire.

ABETTOR, a law-term, implying one who encourages another to the performance of some criminal action, or who is art and part in the performance itself. Treason is the only crime in which abettors are excluded by law, every individual concerned being considered as a principal. It is the same with *Art-and-part* in the Scots law.

ABEX, a country in High Ethiopia, in Africa, bordering on the Red Sea, by which it is bounded on the east. It has Nubia or Sennar on the north; Sennar and Abyssinia on the west; and Abyssinia on the south. Its principal towns are Suaquem and Arkeko. It is subject to the Turks, and has the name of the Beglerbeg of Habeleth. It is about five hundred miles in length and one hundred in breadth, and is a wretched country;

country; for the heat here is almost insupportable, and the air is so unhealthy, that an European cannot stay long in it without the utmost hazard of his life. It is very mountainous, insomuch that there are many more wild beasts than men. There are forests, in which grow a great number of ebony trees.

ABEYANCE, in law, the expectancy of an estate. Thus if lands be leased to one person for life, with reversion to another for years, the remainder for years is an abeyance till the death of the lessee.

ABGAR, or ABGARUS, a name given to several of the kings of Edessa in Syria. The most celebrated of them is one who, it is said, was cotemporary with Jesus Christ; and who having a distemper in his feet, and hearing of Jesus's miraculous cures, requested him, by letter, to come and cure him. Eusebius*, who believed that this letter was genuine, and also an answer our Saviour is said to have returned to it, has translated them both from the Syriac, and asserts that they were taken out of the archives of the city of Edessa. The first is as follows: "Abgarus, prince of Edessa, to "Jesus the holy Saviour, who hath appeared in the flesh "in the confines of Jerusalem, greeting. I have heard "of thee, and of the cures thou hast wrought without "medicines or herbs. For it is reported thou makest "the blind to see, the lame to walk, lepers to be clean, "devils and unclean spirits to be expelled, such as "have been long diseased to be healed, and the dead "to be raised; all which when I heard concerning "thee, I concluded with myself, That either thou "wast a God come down from heaven, or the Son of "God sent to do these things. I have therefore writ-"ten to thee, beseeching thee to vouchsafe to come "unto me, and cure my disease. For I have also heard "that the Jews use thee ill, and lay snares to destroy "thee. I have here a little city, pleasantly situated, "and sufficient for us both. ABGARUS." To this letter, Jesus, it is said, returned an answer by Ananias, Abgarus's courier; which was as follows: "Blessed "art thou, O Abgarus! who hast believed in me "whom thou hast not seen; for the scriptures say of "me, They who have seen me have not believed in "me, that they who have not seen, may, by believing, "have life. But whereas thou writest to have me "come to thee, it is of necessity that I fulfil all things "here for which I am sent; and having finished them, "to return to him that sent me: but when I am re-"turned to him, I will then send one of my disciples "to thee, who shall cure thy malady, and give life to "thee and thine. JESUS." After Jesus's ascension, Judas, who is also named Thomas, sent Thaddeus, one of the seventy, to Abgarus; who preached the gospel to him and his people, cured him of his disorder, and wrought many other miracles: which was done, says Eusebius, A. D. 43.—Though the above letters are acknowledged to be spurious by the candid writers of the church of Rome; several Protestant authors, as Dr Parker, Dr Cave, and Dr Grabe, have maintained that they are genuine, and ought not to be rejected.

* *Eccl. Hist.* lib. i. c. 13.

ABGILLUS (John), surnamed Prester John, was son to a king of the Frisii; and, from the austerity of his life, obtained the name of *Prester*, or Priest. He attended Charlemagne in his expedition to the Holy Land; but instead of returning with that monarch to Europe, it is pretended that he gained mighty conquests, and founded the empire of the Abyssines, called, from his name, the empire of Prester John. He is said to have written the history of Charlemagne's journey into the Holy Land, and of his own into the Indies; but they are more probably trifling romances, written in the ages of ignorance.

ABIANS, anciently a people of Thrace, or (according to some authors) of Scythia. They had no fixed habitations; they led a wandering life. Their houses were waggons, which carried all their possessions. They lived on the flesh of their herds and flocks, on milk, and cheese, chiefly on that of mare's milk. They were unacquainted with commerce. They only exchanged commodities with their neighbours. They possessed lands, but they did not cultivate them. They assigned their agriculture to any who would undertake it, reserving only to themselves a tribute; which they exacted, not with a view to live in affluence, but merely to enjoy the necessaries of life. They never took arms but to oblige those to make good a promise to them by whom it had been broken. They paid tribute to none of the neighbouring states. They deemed themselves exempt from such an imposition; for they relied on their strength and courage, and consequently thought themselves able to repel any invasion. The Abians, we are told, were a people of great integrity. This honourable eulogium is given them by Homer. (Strabo.)

ABIATHAR, high-priest of the Jews, son to Abimelech, who had borne the same office, and received David into his house. This so enraged Saul, who hated David, that he put Abimelech to death, and 81 priests; Abiathar alone escaped the massacre. He afterwards was high-priest; and often gave king David testimonies of his fidelity, particularly during Absalom's conspiracy, at which time Abiathar followed David, and bore away the ark. But after this, conspiring with Adonijah, in order to raise him to the throne of king David his father; this so exasperated Solomon against him, that he divested him of the priesthood, and banished him, A. M. 3021, before Christ 1014.

ABIB, signifying an ear of corn, a name given by the Jews to the first month of their ecclesiastical year, afterwards called *Nisan*. It commenced at the vernal equinox; and according to the course of the moon, by which their months were regulated, answered to the latter part of our March and beginning of April.

ABIDING *by* WRITINGS, in Scots law: When a person founds upon a writing alleged to be false, he may be obliged to declare judicially, whether he will stand or abide by it as a true deed.

ABIES, the FIR-TREE. See PINUS.

ABIGEAT, an old law-term, denoting the crime of stealing cattle by droves or herds. This crime was severely punished; the delinquent being often condemned to the mines, banishment, and sometimes capitally.

ABIHU, brother to Nadab, and son to Aaron. The two former had the happiness to ascend mount Sinai with their father, and there to behold the glory of God: but afterward putting strange fire into their censers, instead of the sacred fire commanded by God, fire rushing upon them killed them. Though all the people bewailed this terrible catastrophe, Moses forbad Aaron and his two sons Eleazar and Ithamar to join in the lamentation.

ABII SCYTHÆ, taken by Strabo to denote the European

ropean Sarmatæ, bordering on the Thracians and Baſtanæ: They were commended by Curtius for their love of juſtice, and by Ammieſius for their contempt of earthly things.

ABIMELECH, king of Gerar, a country of the Philiſtines, was cotemporary with Abraham. This patriarch and his family being there, his wife Sarah, though 90 years of age, was not ſafe in it; for Abimelech carried her off, and was ſo enamoured of her, that he reſolved to marry her. Abraham did not declare himſelf Sarah's huſband; but gave out ſhe was his ſiſter. But the king being warned in a dream, that ſhe was married to a prophet, and that he ſhould die if he did not reſtore her to Abraham, the king obeyed: at the ſame time reproving Abraham for his diſingenuity; who thereupon, among other excuſes, ſaid ſhe was really his ſiſter, being born of the ſame father, tho' of a different mother. Abimelech afterwards gave conſiderable preſents to Abraham; and a covenant, that of Beerſheba, was entered into between them.—After the death of Abraham, there being a famine in the neighbouring countries, Iſaac his ſon alſo withdrew into Gerar, which was then likewiſe governed by a king called—

Abimelech, probably the ſucceſſor of the former. Here Rebekah's beauty forced her huſband to employ Abraham's artifice. Abimelech diſcovering that they were nearly related, chid Iſaac for calling his wife his ſiſter; and at the ſame time forbid all his ſubjects, upon pain of death, to do the leaſt injury to Iſaac or Rebekah—Iſaac's proſperity loſt him the king's friendſhip, and he was deſired to go from among them. He obeyed; but Abimelech afterwards entered into a covenant with him.

Abimelech, the natural ſon of Gideon, by Druma his concubine. His violent acts and death are recorded in Judges, chap. ix.

ABINGDON, a market-town in Berkſhire, ſeated on a branch of the Thames, received its name from an abbey anciently built there. The ſtreets, which are well paved, centre in a ſpacious area, in which the market is held; and in the centre of this area is the market-houſe, which is ſupported on lofty pillars, with a large hall of free-ſtone above, in which the ſummer-aſſizes for the county are held, and other public buſineſs done, the Lent aſſizes being held at Reading. It has two churches; one dedicated to St Nicholas, and the other to St Helena: the latter is adorned with a ſpire, and both are ſaid to have been erected by the abbots of Abingdon. Here are alſo two hoſpitals, one for ſix, and the other for thirteen poor men, and as many poor women; a free ſchool; and a charity-ſchool. The town was incorporated by Queen Mary. It ſends two members to parliament, who are choſen by the inhabitants at large not receiving alms. Its great manufacture is malt, large quantities of which are ſent by water to London. It is ſix miles and a half ſouth of Oxford, 47 eaſt of Glouceſter, and 55 weſt of London. This town is ſuppoſed by Biſhop Gibſon to be the place called, in the Saxon annals, *Cloveſhoo*, where two ſynods are ſaid to have been held, one in 742, and the other in 822. Long. 1. 20. Lat. 51.

ABINTESTATE, in the civil law, is applied to a perſon who inherits the right of one who died inteſtate or without making a will. See Intestate.

ABIPONIANS, a tribe of American Indians, who formerly inhabited the diſtrict of *Chaks* in Paraguay; but the hoſtilities of the Spaniards have now obliged them to remove ſouthward into the territory lying between Santa Fe and St Jago. The only account we have of them is that publiſhed by M. Dobrizhoffer in 1785. This gentleman, who lived ſeven years in their country, informs us that they are not numerous, the whole nation not much exceeding 5000; for which he aſſigns as a reaſon an unnatural cuſtom among their women of ſometimes deſtroying their own children from motives of jealouſy, leſt their huſbands ſhould take other mates during the long time they give ſuck, which is not leſs than two years. They are naturally white, but, by expoſure to the air and ſmoke, become of a brown colour. They are a ſtrong and hardy race of people; which our author attributes to their marrying ſo late, an Abiponian ſeldom or never thinking of marriage till 30 years of age. They are greatly celebrated on account of their chaſtity and other virtues; though, according to our author, they have no knowledge of a Deity. They make frequent incurſions into the territories of the Spaniards, mounted on the horſes which run wild in thoſe parts. They have a kind of order of chivalry for their warriors; and are ſo formidable, that 100 of their enemies will fly before ten of theſe horſemen. The hatred which theſe ſavages, whoſe manners, though rude and uncultivated, are in many reſpects pure and virtuous, bear to the Spaniards, is invincible. "Theſe pretended Chriſtians," ſays our author, "who are the ſcum of the Spaniſh nation, practiſe every kind of fraud and villany among theſe poor barbarians; and their corrupt and vicious morals are ſo adapted to prejudice the Abiponians againſt the Chriſtian religion, that the Jeſuit miſſionaries have, by a ſevere law, prohibited any Spaniard from coming, without a formal permiſſion, into any of their colonies."—From his account of the ſucceſs of the Jeſuits in converting them to Chriſtianity, however, it does not appear that they have been able to do more than bribe them to a compliance with the ceremonies of the Popiſh ſuperſtition; ſo that in general they are quite ignorant and uncivilized: a moſt ſtriking inſtance of which is, that in counting they can go no farther than three; and all the art of the Jeſuits to teach them the ſimpleſt uſe and expreſſion of numbers has proved unſucceſsful.

ABIRAM, a ſeditious Levite, who, in concert with Korah and Dathan, rebelled againſt Moſes and Aaron, in order to ſhare with them in the government of the people; when Moſes ordering them to come with their cenſers before the altar of the Lord, the earth ſuddenly opened under their feet, and ſwallowed up them and their tents; and at the ſame inſtant fire came from heaven, and conſumed 250 of their followers. Numb. xvi.

ABISHAI, ſon of Zeruiah, and brother to Joab, was one of the celebrated warriors who flouriſhed in the reign of David: he killed with his own hand 300 men, with no other weapon but his lance; and ſlew a Philiſtine giant, the iron of whoſe ſpear weighed 300 ſhekels. 1 Sam. xxvi. 2 Sam. xxiii.

ABJURATION, in our ancient cuſtoms, implied an oath, taken by a perſon guilty of felony, and who had fled to a place of ſanctuary, whereby he ſolemnly engaged to leave the kingdom for ever.

Abjuration, is now uſed to ſignify the renouncing, dif-

disclaiming, and denying upon oath, the Pretender to have any kind of right to the crown of these kingdoms.

Abjuration of Heresy, the solemn recantation of any doctrine as false and wicked.

ABLACTATION, or weaning a child from the breast. See Weaning.

Ablactation, among the ancient gardeners, the same with what is called *Grafting by approach*.

ABLAI, a country of Great Tartary, the inhabitants of which, called *Buchars* or *Buchares*, are subject to Russia, but that only for protection. It lies eastward of the river Irtis, and extends five hundred leagues along the southern frontiers of Siberia.

ABLACQUEATION, an old term in gardening, signifies the operations of removing the earth and baring the roots of trees in winter, to expose them more freely to the air, rain, snows, &c.

ABLANCOURT. See Perrot.

ABLATIVE, in grammar, the sixth case of Latin nouns. The word is formed from *auferre*, "to take away." Priscian also calls it the *comparative case;* as serving, among the Latins, for comparing, as well as taking away.

The ablative is opposite to the dative; the first expressing the action of taking away, and the latter that of giving.

In English, French, &c. there is no precise mark whereby to distinguish the ablative from other cases; and we only use the term in analogy to the Latin. Thus, in the two phrases, *the magnitude of the city*, and *he spoke much of the city;* we say, that *of the city* in the first is *genitive*, and in the latter *ablative;* because it would be so, if the two phrases were expressed in Latin.

The question concerning the Greek ablative has been the subject of a famous literary war between two great grammarians, Frischlin and Crusius; the former of whom maintained, and the latter opposed, the reality of it. The dispute still subsists among their respective followers. The chief reason alleged by the former is, that the Roman writers often joined Greek words with the Latin prepositions, which govern ablative cases, as well as with nouns of the same case. To which their opponents answer, that the Latins anciently had no ablative themselves; but instead thereof, made use, like the Greeks, of the dative case; till at length they formed an ablative, governed by prepositions, which were not put before the dative: that, at first, the two cases had always the same termination, as they still have in many instances: but that this was afterwards changed in certain words. It is no wonder then, that the Latins sometimes join prepositions which govern an ablative case, or nouns in the ablative case, with Greek datives, since they were originally the same; and that the Greek dative has the same effect as the Latin ablative.

ABLE, or Abel (Thomas), chaplain to queen Catharine consort to Henry VIII. distinguished himself by his zeal in opposing the proceedings against that unfortunate princess for a divorce. For this purpose he wrote a piece intitled "*Tractatus de non dissolvendo Henrici et Catherinæ matrimonio*, i. e. A Treatise proving that the marriage of king Henry and queen Catherine ought not to be dissolved." But the title of the book, according to bishop Tanner, was *Invicta Veritas*. He took the degree of Bachelor of Arts at Oxford on the 4th of July 1513, and that of Master of Arts on the 27th of July 1516. In 1534 he fell under a prosecution for being concerned in the affair of Elizabeth Barton, called the *Holy Maid of Kent*. This was an infamous impostor, suborned by the monks to use some strange gesticulations, and to pretend to inspiration by the spirit of prophecy; and so well did she act her part, that some people of consequence gave credit to her: but being at last detected, she was condemned and executed, after discovering the names of her principal accomplices and instigators. On her account Able was accused of misprision of treason, by stat. 25. Hen. VIII.; and being also one of those who denied the king's supremacy over the church, he was apprehended and imprisoned; during which time his confinement was so rigorous, that the keeper of Newgate was committed to Marshalsea prison for suffering him to go out upon bail. He was afterwards hanged, drawn, and quartered, at Smithfield in 1540. Bouchier gives him the character of a very learned man; and tells us, that he used to teach the queen music and the learned languages.

ABLECTI, in Roman antiquity, a select body of soldiers chosen from among those called Extraordinarii.

ABLEGMINA, in Roman antiquity, those choice parts of the entrails of victims which were offered in sacrifice to the gods. They were sprinkled with flour, and burnt upon the altar; the priests pouring some wine on them.

ABLUENTS, in medicine, the same with diluters or Diluents.

ABLUTION, in a general sense, signifies the washing or purifying something with water.

Ablution, in a religious sense, a ceremony in use among the ancients, and still practised in several parts of the world: it consisted in washing the body, which was always done before sacrificing, or even entering their houses.—Ablutions appear to be as old as any ceremonies, and external worship itself. Moses enjoined them; the heathens adopted them; and Mahomet and his followers have continued them: thus they have got footing among most nations, and make a considerable part of most established religions. The Egyptian priests had their diurnal and nocturnal ablutions; the Grecians their sprinklings; the Romans their lustrations and lavations; the Jews their washing of hands and feet, beside their baptisms. The ancient Christians had their ablutions before communion; which the Romish church still retain before their mass, sometimes after: the Syrians, Cophts, &c. have their solemn washings on Good-Friday: the Turks their greater and lesser ablutions; their Ghast and Wodou, their Aman, Taharat, &c.

ABNER, the son of Ner, father-in-law to Saul, and general of all his forces, who served him on all occasions with fidelity and courage. After the death of that prince, Abner set Ishbosheth, Saul's son, on the throne. A war breaking out between the tribe of Judah who had elected David king, and Israel, Abner marched against that prince with the flower of his troops, but was defeated. Abner afterward, being disguised, went over to David, and disposed the chiefs of the army and the elders of Israel to declare for him; and was received by David with such testimonies of affection, as gave umbrage to Joab, who killed him traiterously.

ABNOBA, now ABENOW, a long range of mountains in Germany, taking different names according to the different countries they run through. As about the river Maine, called the *Oden* or *Ottenwald*; between Hesse and Franconia, the *Spessart*; and about the duchy of Wirtemberg, where the Danube takes its rise, called the *Baar*.

ABO, a maritime town in Sweden: it is the capital of the province of Finland, and lies upon the point where the gulphs of Bothnia and Finland unite. It is a good port; and is the see of a bishop, suffragan of Upsal. It has an university, founded by queen Christina in 1640, and endowed with the same privileges as that of *Upsal*. There is also a school here, which was founded by Gustavus Adolphus, for 300 scholars. The town is tolerably well built, and contains several brick buildings; but the generality are of wood painted red. The inhabitants export linen, corn, and planks. It lies 120 miles north-east from Stockholm. E. Long. 21. 28. Lat. 60. 50.

ABOARD, the inside of a ship. Hence any person who enters a ship is said to *go aboard*: but when an enemy enters in the time of battle, he is said to *board*; a phrase which always implies hostility.—To *fall aboard of*, is to strike or *encounter* another ship when one or both are in motion, or to be driven upon a ship by the force of the wind or current.—*Aboard-main-tack*, the order to draw the main-tack, *i. e.* the lower corner of the main-sail, down to the CHESS-TREE.

ABOLITION, implies the act of annulling, destroying, making void, or reducing to nothing. In law, it signifies the repealing any law or statute.

ABOLLA, a warm kind of garment, lined or doubled, worn by the Greeks and Romans, chiefly out of the city, in following the camp.—Critics and antiquaries are greatly divided as to the form, use, kinds, &c. of this garment. Papias makes it a species of the toga, or gown; but Nonius, and the generality, a species of the pallium, or cloak. The *abolla* seems rather to have stood opposed to the *toga*, which was a garment of peace, as the *abolla* was of war; at least Varro and Martial place them in this opposite light. There seem to have been different kinds of Abollas, fitted to different occasions. Even kings appear to have used the abolla: Caligula was affronted at king Ptolemy for appearing at the shews in a purple abolla, and by the eclat thereof turning the eyes of the spectators from the emperor upon himself.

ABOMASUS, ABOMASUM, or ABOMASIUS, names of the fourth stomach of ruminating animals. It is in the abomasus of calves and lambs that the runnet or earning is formed wherewith milk is curdled. See COMPARATIVE *Anatomy*.

ABOMINATION, a term used in scripture with regard to the Hebrews, who, being shepherds, are said to have been an abomination to the Egyptians, because they sacrificed the sacred animals of that people, as oxen, goats, sheep, &c. which the Egyptians esteemed as abominations, or things unlawful. The term is also applied in the sacred writings to idolatry and idols, because the worship of idols is in itself an abominable thing, and at the same time ceremonies observed by idolaters were always attended with licentiousness and other odious and abominable actions. The *abomination of desolation*, foretold by the prophet Daniel, is supposed to imply the statue of Jupiter Olympius, which Antiochus Epiphanes caused to be placed in the temple of Jerusalem. And the *abomination of desolation*, mentioned by the Evangelists, signifies the ensigns of the Romans, during the last siege of Jerusalem by Titus, on whom the figures of their gods and emperors were embroidered, and placed upon the temple after it was taken.

ABON, ABONA, or ABONIS (anc. geog.), a town and river of Albion. The town, according to Camden, is Abingdon; and the river Abhon or Avon. But by Antonine's Itinerary, the distance is nine miles from the Venta Silurum, or Caer-Went: others, therefore, take the town to be Porshut, at the mouth of the river Avon, over against Bristol. Abhon or Avon, in the Celtic language, denotes a river.

ABORIGINES, (Dionysius of Halicarnassus, Livy, Virgil); originally a proper name, given to a certain people in Italy, who inhabited the ancient Latium, or country now called *Campagna di Roma*. In this sense the Aborigines are distinguished from the Janigenæ, who, according to the false Berosus, inhabited the country before them; from the Siculi, whom they expelled; from the Grecians, from whom they descended; from the Latins, whose name they assumed after their union with Æneas and the Trojans; lastly, from the Ausonii, Volsci, Oenotrii, &c. neighbouring nations in other parts of the country. Whence this people came by the appellation, is much disputed. St Jerom says, they were so called, as being, *absque origine*, the primitive planters of the country after the flood: Dion. of Halicarnassus accounts for the name, as denoting them the founders of the race of inhabitants of that country: others think them so called, as being originally Arcadians, who claimed to be earth-born, and not descended from any people. Aurelius Victor suggests another opinion, viz. that they were called *Aborigines*, q. d. *Aberrigines*, from *ab* "from," and *errare* "to wander;" as having been before a wandering people. Pausanias rather thinks they were thus called απο ορεσι, from "mountains;" which opinion seems confirmed by Virgil, who, speaking of Saturn, the legislator of this people, says,

Is genus indocile ac dispersum montibus altis
Composuit, legesque dedit.——

The Aborigines were either the original inhabitants of the country, settled there by Janus, as some imagine; or by Saturn, or Cham, as others; not long after the dispersion, or even, as some think, before it: Or they were a colony sent from some other nation; who expelling the ancient inhabitants the Siculi, settled in their place.—About this mother-nation there is great dispute. Some maintain it to be the Arcadians, parties of whom were brought into Italy at different times; the first under the conduct of Oenotrius, son of Lycaon, 450 years before the Trojan war; a second from Thessaly; a third under Evander, 60 years before the Trojan war: besides another under Hercules; and another of Lacedæmonians, who fled from the severe discipline of Lycurgus: all these uniting, are said to have formed the nation or kingdom of the Aborigines. Others will have them of barbarian rather than Grecian origin, and to have come from Scythia; others from Gaul. Lastly, others will have them to be Canaanites, expelled by Joshua.

The term *Aborigines*, though ſo famous in antiquity, is uſed in modern geography only occaſionally as an appellative. It is given to the primitive inhabitants of a country, in contradiſtinction to colonies, or new races of people.

ABORTION, in midwifery, the excluſion of a fœtus before it has acquired a ſufficient degree of perfection to enable it to perform reſpiration and the other vital functions. See MIDWIFERY.

The practice of procuring abortions was prohibited by the ancient Greek legiſlators Solon and Lycurgus. Whether or not it was permitted among the Romans, has been much diſputed. It is certain the practice, which was by them called *viſceribus vim inferre*, was frequent enough: but whether there was any penalty on it, before the emperors Severus and Antonine, is the queſtion. Noodt maintains the negative; and further, that thoſe princes only made it criminal in one particular caſe, viz. of a married woman's practiſing it out of reſentment againſt her huſband, in order to defraud him of the comfort of children: this was ordered to be puniſhed by a temporary exile. The foundation on which the practice is ſaid to have been allowed, was, that the fœtus, while *in utero*, was reputed as a part of the mother, ranked as one of her own viſcera, over which ſhe had the ſame power as over the reſt: beſides, that it was not reputed as a man, *homo;* nor to be alive, otherwiſe than as a vegetable: conſequently, that the crime amounted to little more than that of plucking unripe fruit from the tree. Seneca repreſents it as a peculiar glory of Helvia, that ſhe had never, like other women, whoſe chief ſtudy is their beauty and ſhape, deſtroyed the fœtus in her womb. The primitive fathers, Athenagoras, Tertullian, Minutius Felix, Auguſtin, &c. declaimed loudly againſt the practice as virtual murder. Several councils have condemned it. Yet we are told that the modern Romiſh eccleſiaſtical laws allow of diſpenſations for it. Egane mentions the rates at which a diſpenſation for it may be had.

The practice of artificial abortion is chiefly in the hands of women and nurſes, rarely in that of phyſicians; who, in ſome countries, are not admitted to the profeſſion without abjuring it. Hippocrates, in the oath he would have enjoined on all phyſicians, includes their not giving the *peſſus abortivus;* though elſewhere he gives the formal proceſs whereby he himſelf procured in a young woman a miſcarriage. It may, however, be obſerved, that often all the powers of art prove ineffectual, and no leſs often do the attempts prove the means of puniſhment by the fatal conſequences which they produce.

ABORTION, among gardeners, ſignifies ſuch fruits as are produced too early, and never arrive at maturity.

ABORTIVE, is, in general, applied to whatever comes before its legitimate time, or to any deſign which miſcarries.

ABORTIVE Corn, a diſtemper of corn mentioned by M. Gillet, and ſuſpected to be occaſioned by inſects. It appears long before harveſt, and may be known by a deformity of the ſtalk, the leaves, the ear, and even the grain.

ABORTIVE Vellum is made of the ſkin of an abortive calf.

ABOUKIR, a ſmall town of Egypt, ſituate in the deſart between Alexandria and Roſetta. It is the ancient Canopus, and is ſituated, according to Mr Savary, ſix leagues from Pharos. Pliny ſays, from the teſtimonies of antiquity, that it was formerly an iſland; and its local appearance makes this credible; for the grounds around it are ſo low, that the ſea ſtill covered a part of them in the days of Strabo. The town is built upon a rock, which forms a handſome road for ſhipping, and was out of the reach of inundations. See CANOPUS.

ABOUT, the ſituation of a ſhip immediately after ſhe has *tacked*, or changed her courſe by going about and ſtanding on the other tack.—*About ſhip!* the order to the ſhip's crew to prepare for tacking.

ABOUTIGE, a town in Upper Egypt, in Africa, near the Nile, where they make the beſt opium in all the Levant. It was formerly a large, but now is a mean place. N. Lat. 26. 50.

ABRA, a ſilver coin ſtruck in Poland, and worth about one ſhilling Sterling. It is current in ſeveral parts of Germany, Conſtantinople, Aſtracan, Smyrna, and Grand Cairo.

ABRABANEL, ABARBANEL, or AVRAVANEL, (Iſaac), a celebrated rabbi, deſcended from king David, and born at Liſbon A. D. 1437. He became counſellor to Alphonſo V. king of Portugal, and afterwards to Ferdinand the Catholic; but in 1492 was obliged to leave Spain with the other Jews. In ſhort, after reſiding at Naples, Corfou, and ſeveral other cities, he died at Venice in 1508, aged 71. Abrabanel paſſed for one of the moſt learned of the rabbis; and the Jews gave him the names of the Sage, the Prince, and the Great Politician. We have a Commentary of his on all the Old Teſtament, which is pretty ſcarce: he there principally adheres to the literal ſenſe; and his ſtyle is clear, but a little diffuſe. His other works are, A Treatiſe on the Creation of the World; in which he refutes Ariſtotle, who imagined that the world was eternal: A Treatiſe on the explication of the prophecies relating to the Meſſiah, againſt the Chriſtians: A book concerning articles of Faith; and ſome others leſs ſought after. Though Abrabanel diſcovers his implacable averſion to Chriſtianity in all his writings, yet he treated Chriſtians with politeneſs and good-manners in the common affairs of life.

ABRACADABRA, a magical word, recommended by Serenus Samonicus as an antidote againſt agues and ſeveral other diſeaſes. It was to be written upon a piece of paper as many times as the word contains letters, omitting the laſt letter of the former every time, as in the margin †, and repeated in the ſame order; and then ſuſpended about the neck by a linen thread. *Abracadabra* was the name of a god worſhipped by the Syrians; ſo wearing his name was a ſort of invocation of his aid: a practice which, though not more uſeful, yet was leſs irrational, than is the equally heatheniſh practice among thoſe who call themſelves Chriſtians, of wearing various things, in expectation of their operating by a Sympathy, whoſe parents were Ignorance and Superſtition.

†
abracadabra
abracadabr
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ABRAHAM, the father and ſtock whence the faithful ſprung, was the ſon of Terah. He was deſcended from Noah by Shem, from whom he was nine degrees removed. Some fix his birth in the 130th year of Terah's age, but others place it in his father's 70th year. It is highly probable he was born in the city of Ur, in Chaldea, which he and his father left when they

went to Canaan, where they remained till the death of Terah; after which, Abraham reſumed his firſt deſign of going to Paleſtine. The Scriptures mention the ſeveral places he ſtopped at in Canaan; his journey into Egypt, where his wife was carried off from him; his going into Gerar, where Sarah was again taken from him, but reſtored as before; the victory he obtained over the four kings who had plundered Sodom; his compliance with his wife, who inſiſted that he ſhould make uſe of their maid Hagar in order to raiſe up children; the covenant God made with him, ſealed with the ceremony of circumciſion; his obedience to the command of God, who ordered him to offer up his only ſon as a ſacrifice, and how this bloody act was prevented; his marriage with Keturah; his death at the age of 175 years; and his interment at the cave of Macpelah, near the body of Sarah his firſt wife. It would be of little uſe to dwell long upon theſe particulars, ſince they are ſo well known. But tradition has ſupplied numberleſs others, the mention of one or two of which may not be unacceptable.

Many extraordinary particulars have been told relating to his converſion from idolatry. It is a pretty general opinion, that he ſucked in the poiſon with his milk; that his father made ſtatues, and taught that they were to be worſhipped as gods*. Some Jewiſh authors relate †, that Abraham followed the ſame trade with Terah for a conſiderable time. Maimonides‡ ſays, that he was bred up in the religion of the Sabæans, who acknowledged no deity but the ſtars; that his reflections on the nature of the planets, his admiration of their motions, beauty, and order, made him conclude there muſt be a being ſuperior to the machine of the univerſe, a being who created and governed it: however, according to an old tradition, he did not renounce paganiſm till the 50th year of his age. It is related ‖, that his father, being gone a journey, left him to ſell the ſtatues in his abſence; and that a man, who pretended to be a purchaſer, aſked him how old he was. Abraham anſwered, "Fifty."—"Wretch that thou art, (ſaid the other), for adoring, at ſuch an age, a being which is but a day old!" Theſe words greatly confounded Abraham. Some time afterwards, a woman brought him ſome flour, that he might give it as an offering to the idols; but Abraham, inſtead of doing ſo, took up a hatchet and broke them all to pieces, excepting the largeſt, into the hand of which he put the weapon. Terah, at his return, aſked whence came all this havock? Abraham made anſwer, that the ſtatues had had a great conteſt which ſhould eat firſt of the oblation; "Upon which (ſaid he), the god you ſee there, being the ſtouteſt, hewed the others to pieces with that hatchet." Terah told him this was bantering; for thoſe idols had not the ſenſe to act in this manner. Abraham retorted theſe words upon his father againſt the worſhipping of ſuch gods. Terah, ſtung with this raillery, delivered up his ſon to the cogniſance of Nimrod, the ſovereign of the country: who exhorted Abraham to worſhip the fire; and, upon his refuſal, commanded him to be thrown into the midſt of the flames: "Now let your God (ſaid he) come and deliver you:" But (adds the tradition), Abraham came ſafe and found out of the flames.—This tradition is not of modern date, ſince it is told by St Jerom §; who ſeems to credit it in general, but diſbelieves that part of it which makes Terah ſo cruel as to be the informer againſt his own ſon. Perhaps the ambiguity of the word *Ur** might have given riſe to the fiction altogether. Such as lay ſtreſs on the following words which God ſays to Abraham (Gen. xv. 7.), *I am the Lord that brought thee out of Ur of the Chaldees*, imagine that he ſaved him from a great perſecution, ſince he employed the very ſame words in the beginning of the decalogue to denote the deliverance from Egypt.

* Suidas, in Εαρυχ. See Joſ. xxiv. 2.

† Apud Gebrand. in Chron.

‡ More Nevoch. c. 29.

‖ Heidegger Hiſt. Patriarch. tom. iii. p. 36.

§ Tradit. Hebraic. in Geneſin.

* It is the proper name of a city, and it alſo ſignified *fire*. The Lat. verſion, Eſdras ix. has it thus: *Qui elegiſti eum de igne Chaldeorum.*

Abraham is ſaid to have been well ſkilled in many ſciences, and to have wrote ſeveral books. Joſephus† tells us that he taught the Egyptians arithmetic and geometry; and, according to Eupolemus and Artapan, he inſtructed the Phœnicians, as well as the Egyptians, in aſtronomy. A work which treats of the creation has been long aſcribed to him; it is mentioned in the Talmud‡, and the Rabbis Chanina and Hoſchia uſed to read it on the eve before the ſabbath. In the firſt ages of Chriſtianity, according to St Epiphanius ‖, a heretical ſect, called Sethinians, diſperſed a piece which had the title of *Abraham's Revelation*. Origen mentions alſo a treatiſe ſuppoſed to be wrote by this patriarch. All the ſeveral works which Abraham compoſed in the plains of Mamre, are ſaid to be contained in the library of the monaſtery of the Holy Croſs on Mount Amaria, in Ethiopia §. The book on the creation was printed at Paris 1552, and tranſlated into Latin by Poſtel: Rittangel, a converted Jew, and profeſſor at Konigſberg, gave alſo a Latin tranſlation of it, with remarks, in 1642.

† Antiq. lib. i. cap. 7, 8.

‡ Heidegger Hiſt. Patriarch. tom. ii. p. 143.

‖ Adverſ. Hær. p. 286.

§ Kirchem's treatiſe of libraries, p. 142.

Abraham Usque, a Portugueſe Jew, who tranſlated the Bible out of Hebrew into Spaniſh. It was printed at Ferrara in 1553, and reprinted in Holland in 1630. This Bible, eſpecially the firſt edition, which is moſt valuable, is marked with ſtars at certain words, which are deſigned to ſhow that theſe words are difficult to be underſtood in the Hebrew, and that they may be uſed in a different ſenſe.

Abraham (Nicholas), a learned Jeſuit born in the dioceſe of Toul, in Lorrain, in 1589. He obtained the rank of divinity profeſſor in the univerſity of Pont-a-Mouſon, which he enjoyed 17 years, and died September 7, 1655. He wrote Notes on Virgil and on Nonnius; A Commentary on ſome of Cicero's Orations, in 2 vols folio; An excellent collection of theological pieces, in folio, intitled *Pharus Veteris Teſtamenti*; and ſome other works.

ABRAHAMITES, an order of monks exterminated for idolatry by Theophilus in the ninth century. Alſo the name of another ſect of heretics who had adopted the errors of Paulus. See Paulicians.

ABRANTES, a town of Portugal, in Eſtremadura, ſeated on the river Tajo, belongs to a marquis of the ſame name. It ſtands high, is ſurrounded with gardens and olive-trees, and contains thirty-five thouſand inhabitants. It has four convents, an alms-houſe, and an hoſpital. W. Long. 7. 18. Lat. 39. 13.

ABRASAX, or Abraxas, the ſupreme god of the Baſilidian heretics. It is a myſtical word, compoſed of the Greek numerals α, β, ρ, α, ξ, α, ς, which together make up the number CCCLXV. For Baſilides taught, that there were 365 heavens between the earth and the empyrean; each of which heavens had its angel or intelligence, which created it; each of which angels like-

wiſe

wise was created by the angel next above it; thus ascending by a scale to the supreme Being, or first Creator. The Basilidians used the word *Abraxas* by way of charm or amulet.

ABRASION, is sometimes used, among medicinal writers, for the effect of sharp corrosive medicines or humours in wearing away the natural mucus which covers the membranes, and particularly those of the stomach and intestines. The word is composed of the Latin *ab* and *rado*, to *shave* or *scrape off*.

ABRAVANNUS (anc. geog.), the name of a promontory and river of Galloway, in Scotland, so called from the Celtic terms *Aber*, signifying either the mouth of a river, or the confluence of two rivers, and *Avon*, a river.

ABRAUM, in natural history, a name given by some writers to a species of red clay, used in England by the cabinet-makers, &c. to give a red colour to new mahogany wood. We have it from the isle of Wight; but it is also found in Germany and Italy.

ABRAXAS, an antique stone with the word *abraxas* engraven on it. They are of various sizes, and most of them as old as the third century. They are frequent in the cabinets of the curious; and a collection of them, as complete as possible, has been desired by several. There is a fine one in the abbey of St Genevieve, which has occasioned much speculation. Most of them seem to have come from Egypt; whence they are of some use for explaining the antiquities of that country. Sometimes they have no other inscription besides the word: but others have the names of saints, angels, or Jehovah himself annexed; though most usually the name of the Basilidian god. Sometimes there is a representation of Isis sitting on a lobes, or apis, surrounded with stars; sometimes monstrous compositions of animals, obscene images, Phalli and Ithyfalli. The graving is rarely good, but the word on the reverse is sometimes said to be in a more modern taste than the other. The characters are usually Greek, Hebrew, Coptic, or Hetnerian, and sometimes of a mongrel kind, invented, as it would seem, to render their meaning the more inscrutable. It is disputed whether the Veronica of Montreuil, or the granite obelisk mentioned by Gori, be *Abraxases*.

ABREAST (a sea-term), side by side, or opposite to; a situation in which two or more ships lie, with their sides parallel to each other, and their heads equally advanced. This term more particularly regards the line of battle at sea, where, on the different occasions of attack, retreat, or pursuit, the several squadrons or divisions of a fleet are obliged to vary their dispositions, and yet maintain a proper regularity by sailing in right or curved lines. When the line is formed *abreast*, the whole squadron advances uniformly, the ships being equally distant from and parallel to each other, so that the length of each ship forms a right angle with the extent of the squadron or line abreast. The commander in chief is always stationed in the centre, and the second and third in command in the centres of their respective squadrons.—*Abreast*, within the ship, implies on a line with the beam, or by the side of any object aboard; as, the frigate sprung a leak *abreast* of the main hatch-way, *i. e.* on the same line with the main hatch-way, crossing the ship's length at right angles, in opposition to AFORE or ABAFT the hatch-way.—We discovered a fleet *abreast* of Beachy-head; *i. e.* off, or directly opposite to it.

ABRETTENE, or ABRETTINE (anc. geog.), a district of Mysia, in Asia. Hence the epithet *Abrettenus* given Jupiter, (Strabo); whose priest was Cleon, formerly at the head of a gang of robbers, and who received many and great favours at the hand of Antony, but afterwards went over to Augustus. The people were called *Abretteni;* inhabiting the country between Ancyra of Phrygia and the river Rhyndacus.

ABRIDGEMENT, in literature, a term signifying the reduction of a book into a smaller compass.

The art of conveying much sentiment in few words, is the happiest talent an author can be possessed of. This talent is peculiarly necessary in the present state of literature; for many writers have acquired the dexterity of spreading a few tritical thoughts over several hundred pages. When an author hits upon a thought that pleases him, he is apt to dwell upon it, to view it in different lights, to force it in improperly, or upon the slightest relations. Though this may be pleasant to the writers, it tires and vexes the reader. There is another great source of diffusion in composition. It is a capital object with an author, whatever be the subject, to give vent to all his best thoughts. When he finds a proper place for any of them, he is peculiarly happy. But, rather than sacrifice a thought he is fond of, he forces it in by way of digression, or superfluous illustration. If none of these expedients answer his purpose, he has recourse to the margin, a very convenient apartment for all manner of pedantry and impertinence. There is not an author, however correct, but is more or less faulty in this respect. An abridger, however, is not subject to these temptations. The thoughts are not his own; he views them in a cooler and less affectionate manner; he discovers an impropriety in some, a vanity in others, and a want of utility in many. His business, therefore, is to retrench superfluities, digressions, quotations, pedantry, &c. and to lay before the public only what is really useful. This is by no means an easy employment: To abridge some books, requires talents equal, if not superior, to those of the author. The facts, manner, spirit, and reasoning, must be preserved; nothing essential, either in argument or illustration, ought to be omitted The difficulty of the task is the principal reason why we have so few good abridgements: Wynne's abridgement of Locke's Essay on the Human Understanding, is, perhaps, the only unexceptionable one in our language.

These observations relate solely to such abridgements as are designed for the public. But,

When a person wants to set down the substance of any book, a shorter and less laborious method may be followed. It would be foreign to our plan to give examples of abridgements for the public: But as it may be useful, especially to young people, to know how to abridge books for their own use, after giving a few directions, we shall exhibit an example or two, to show with what ease it may be done.

Read the book carefully; endeavour to learn the principal view of the author; attend to the arguments employed: When you have done so, you will generally find, that what the author uses as new or additional arguments, are in reality only collateral ones, or extensions of the principal argument. Take a piece of

paper or a common-place book, put down what the author wants to prove, ſubjoin the argument or arguments, and you have the ſubſtance of the book in a few lines. For example,

In the Eſſay on Miracles, Mr Hume's deſign is to prove, That miracles which have not been the immediate objects of our ſenſes, cannot reaſonably be believed upon the teſtimony of others.

Now, his argument (for there happens to be but one) is,

"That experience, which in ſome things is variable, "in others uniform, is our *only* guide in reaſoning "concerning matters of fact. A variable experience "gives riſe to probability only; an uniform experi-"ence amounts to a proof. Our belief of any fact "from the teſtimony of eye-witneſſes is derived from "no other principle than our experience in the vera-"city of human teſtimony. If the fact atteſted be "miraculous, here ariſes a conteſt of two oppoſite ex-"periences, or proof againſt proof. Now, a miracle "is a violation of the laws of nature; and as a firm and "unalterable experience has eſtabliſhed theſe laws, the "proof againſt a miracle, from the very nature of the "fact, is as complete as any argument from experi-"ence can poſſibly be imagined; and if ſo, it is an "undeniable conſequence, that it cannot be ſurmounted "by any proof whatever derived from human teſtimony."

In Dr Campbell's Diſſertation on Miracles, the author's principal aim is to ſhow the fallacy of Mr Hume's argument; which he has done moſt ſucceſsfully by another ſingle argument, as follows:

"The evidence ariſing from human teſtimony *is not* "*ſolely* derived from experience: on the contrary, te-"ſtimony hath a natural influence on belief antecedent "to experience. The early and unlimited aſſent given "to teſtimony by children gradually contracts as they "advance in life: it is, therefore, more conſonant to "truth, to ſay, that our *diffidence* in teſtimony is the "reſult of experience, than that our *faith* in it has this "foundation. Beſides, the uniformity of experience, "in favour of any fact, is not a proof againſt its be-"ing reverſed in a particular inſtance. The evidence "ariſing from the ſingle teſtimony of a man of known "veracity will go farther to eſtabliſh a belief in its be-"ing actually reverſed: If his teſtimony be confirmed "by a few others of the ſame character, we cannot "with-hold our aſſent to the truth of it. Now, tho' "the operations of nature are governed by uniform "laws, and though we have not the teſtimony of our "ſenſes in favour of any *violation* of them; ſtill, if in "particular inſtances we have the teſtimony of *thou-"ſands* of our fellow-creatures, and thoſe too men of "ſtrict integrity, ſwayed by no motives of ambition "or intereſt, and governed by the principles of com-"mon-ſenſe, That they were actually eye-witneſſes "of theſe violations, the conſtitution of our nature "obliges us to believe them."

Theſe two examples contain the ſubſtance of about 400 pages.——Making private abridgements of this kind has many advantages; it engages us to read with accuracy and attention; it fixes the ſubject in our minds; and, if we ſhould happen to forget, inſtead of reading the books again, by glancing a few lines we are not only in poſſeſſion of the chief arguments, but recal in a good meaſure the author's method and manner.

Abridging is peculiarly uſeful in taking the ſubſtance of what is delivered by Profeſſors, &c. It is impoſſible, even with the aſſiſtance of ſhort-hand, to take down, *verbatim*, what is ſaid by a public ſpeaker. Beſides, although it were practicable, ſuch a talent would be of little uſe. Every public ſpeaker has circumlocutions, redundancies, lumber, which deſerve not to be copied. All that is really uſeful may be comprehended in a ſhort compaſs. If the plan of the diſcourſe, and arguments employed in ſupport of the different branches, be taken down, you have the whole. Theſe you may afterwards extend in the form of a diſcourſe dreſſed in your own language. This would not only be a more rational employment, but would likewiſe be an excellent method of improving young men in compoſition; an object too little attended to in all our univerſities.

ABRINCATARUM OPPIDUM (anc. geog.), the town of the *Abrincatæ* or *Abrincatui*, now *Avranches*, in France, ſituated on an eminence in the ſouth-weſt of Normandy near the borders of Brittany on the Engliſh channel. W. Long. 1. 10. N. Lat. 48. 40.

ABROGATION, the act of aboliſhing a law, by authority of the maker; in which ſenſe the word is ſynonymous with abolition, repealing, and revocation.

Abrogation ſtands oppoſed to *rogation:* it is diſtinguiſhed from *derogation*, which implies the taking away only ſome part of a law; from *ſubrogation*, which denotes the adding a clauſe to it; from *obrogation*, which implies the limiting or reſtraining it; from *diſpenſation*, which only ſets it aſide in a particular inſtance; and from *antiquation*, which is the refuſing to paſs a law.

ABROKANI, or MALLEMOLLI, a kind of muſlin, or clear white fine cotton cloth, brought from the Eaſt Indies, particularly from Bengal; being in length 16 French ells and 3 quarters, and in breadth 5 eighths.

ABROLKOS, the name of certain ſhelves, or banks of ſand, about 20 leagues from the coaſt of Brazil.

ABROTANUM, in botany. See ARTEMISIA and SANTOLINA.

ABROTONUM (anc. geog.), a town and harbour on the Mediterranean, in the diſtrict of Syrtis Parva, in Africa, one of the three cities that went to form Tripoly.

ABRUS, in botany, the trivial name of the GLYCINE.

ABRUZZO, a province in Naples. The river Peſcara divides it into two parts; one of which is called Ulterior, whereof Aquila is the capital; and the other Citerior, whoſe capital is Solomona. Beſides the Appenines, there are two conſiderable mountains, the one called Monte Cavallo, and the other Monte Maiello; the top of which laſt is always covered with ſnow. Abruzzo is a cold country; but the rigour of the climate is not ſo great as to prevent the country from producing in abundance every thing requiſite for the ſupport of life. Vegetables, fruits, animals, and numberleſs other articles of ſuſtenance, not only furniſh ample proviſion for the uſe of the natives, but alſo allow of exportation. There is ſo large a quantity of wheat reaped, that many thouſands of quarters are annually ſhipped off. Much Turkey wheat is ſent out, and the province of Teramo ſells a great deal of rice little inferior in goodneſs to that of Lombardy. Oil is a plentiful commodity, and wines are made for exportation on many parts of the coaſt; but wool has always been,

and ftill is, their ftaple commodity: the flocks, after paffing the whole fummer in the fine paftures of the mountains, are driven for the winter into the warm plains of Puglia, and a few fpots near their own coaft, where the fnow does not lie; there are no manufactures of woollens in the province, except two fmall ones of coarfe cloth, and the greateft part of the wool is fent out unwrought. No filk is made here, though mulberry-trees would grow well in the low grounds.

Formerly the territory of Aquila furnifhed Italy almoft exclufively with faffron; but fince the culture of that plant has been fo much followed in Lombardy, it has fallen to nothing in Abruzzo. In the maritime tracks of country the cultivation of liquorice has been increafed of late years, but foreigners export the roots in their natural ftate: in the province of Teramo there is a manufactory of pottery-ware, for which there is a great demand in Germany, by the way of Triefte, as it is remarkably hard and fine; but even this is going to decay, by being abandoned entirely to the ignorance of common workmen. It is not to be expected that any improvements will be made in arts and manufactures, where the encouragement and attention of fuperiors is wanting, and no pains taken to render the commodity more marketable, or to open better channels of fale for it. The only advantages thefe provinces enjoy, are the gift of benevolent nature; but fhe has ftill greater prefents in ftore for them, and waits only for the helping hand of government to produce them. This whole coaft, one hundred miles in length, is utterly deftitute of fea-ports; and the only fpots where the produce can be embarked are dangerous inconvenient roads, at the mouths of rivers, and along a lee-fhore: the difficulty of procuring fhipping, and of loading the goods, frequently caufes great quantities of them to rot on hand; which damps induftry, and prevents all improvements in agriculture. The hufbandman is a poor difpirited wretch, and wretchednefs produces emigration: the uneven furface of the country occafions it to be inhabited by retail, if the expreffion may be ufed, rather than in large maffes; for there is not a city that contains ten thoufand people, and the moft of them would find it difficult to mufter three thoufand. Villages, caftles, and feudatory eftates, are to be met with in abundance; but the numbers of their inhabitants are to be reckoned by hundreds, not thoufands: in a word, the political and focial fyftem of the province fhows no figns of the vigour which nature fo remarkably difplays here in all her operations.

The antiquary and the naturalift may travel here with exquifite pleafure and profit; the former will find treafures of infcriptions, and inedited monuments appertaining to the warlike nations that once covered the face of the country: the natural philofopher will have a noble field for obfervation in the ftupendous monuments that rife on all fides. Monte-corno and Majella are among the moft interefting; the firft is like an aged monument of nature, bald, and horribly broken on every afpect: from various appearances, it is evident that its bowels contain many valuable veins of metallic ore; but the great difficulty of accefs renders the fearch of them almoft impracticable. Majella has other merits, and of a gayer kind:—nature has clothed its declivities and elevated fields with an infinite variety of her moft precious plants; vulnerary herbs grow there in as great perfection as on the Alps of Swifferland, and are applied by the natives to wounds with equal fuccefs.

The character of the inhabitants varies a little among themfelves, according to fituation and climate, but effentially from the difpofition of the natives of the more fouthern provinces. This proceeds from a difference of origin: for the Lombards, who were barbarians, but not cruel; poor, but hofpitable; endowed with plain honeft fenfe, though poffeffed of little acutenefs or fubtlety; remained peaceable proprietors of thefe mountainous regions, till the Normans, who were accuftomed to a fimilar climate, came, and difpoffeffed them. The Greeks, who retained almoft every other part of the kingdom under their dominion, never had any fway here. For this reafon the Abruzzefi ftill bear a great refemblance to their northern progenitors or mafters: to this day, one may trace in them the fame goodnefs of heart, but great indolence, and repugnance to lively exertions; a fault that proceeds rather from a want of active virtue, than a difpofition to wickednefs. Hence it comes that in thefe provinces, where the proximity of the frontier almoft infures impunity, fewer atrocious and inhuman deeds are heard of than in other parts of the realm. Remnants of ancient northern cuftoms exifted here fo late as the beginning of this century, and, among the mountaineers, very evident traces of the Frank and Teutonic languages may be difcovered.

ABSALOM, the fon of David by Maacah, was brother to Thamar, David's daughter, who was ravifhed by Amnon their eldeft brother by another mother. Abfalom waited two years for an opportunity of revenging the injury done to his fifter; and at laft procured the affaffination of Amnon at a feaft which he had prepared for the king's fons. He took refuge with Talmai king of Gefhur; and was no fooner reftored to favour, but he engaged the Ifraelites to revolt from his father. Abfalom was defeated in the wood of Ephraim: as he was flying, his hair caught hold of an oak, where he hung till Joab came and thruft him through with three darts: David had exprefsly ordered his life to be fpared, and extremely lamented him.

ABSCESS, in furgery; from *abfcedo*, to depart. A cavity containing pus; or, a gathering of matter in a part: So called, becaufe the parts which were joined are now feparated; one part recedes from another, to make way for the collected matter. See SURGERY.

ABSCISSE, in conics, a part of the diameter or tranfverfe axis of a conic fection intercepted between the vertex or fome other fixed point and a femiordinate. See *CONIC Sections*.

ABSCONSA, a dark lanthern ufed by the monks at the ceremony of burying their dead.

ABSENCE, in Scots law: When a perfon cited before a court does not appear, and judgment is pronounced, that judgment is faid to be *in abfence*. No perfon can be tried criminally in abfence.

ABSINTHIATED, any thing tinged or impregnated with abfinthium or wormwood. Bartholin mentions a woman whofe milk was become abfinthiated, and rendered as bitter as gall, by the too liberal ufe of wormwood.

Vinum abfinthites, or *poculum abfinthiatum*, "wormwood wine," is much fpoke of among the ancients as a

wholeſome drink, and even an antidote againſt drunkenneſs; though ſome have charged it with being offenſive to the head, and liable to cauſe fevers, caphalalgias, vomitings, uterine fluxes, &c. Ray alſo makes it a preventative of venery. According to the common opinion, it is made by infuſing the leaves of the plant in wine; but, according to Fehr, it ought to be prepared by fermentation, in order to correct the crudities, and call forth a volatile ſalt; which laſt, however, does not exiſt in wormwood. Some prefer the diſtilled water; but whatever virtues wormwood poſſeſſes reſide entirely in its eſſential oil.

ABSINTHIUM, in botany, the trivial name of the common wormwood. See the article ARTEMISIA.

ABSIS, in aſtronomy, the ſame with apſis. See APSIS.

ABSOLUTE, in a general ſenſe, ſomething that ſtands free or independent.

ABSOLUTE is more particularly underſtood of a being or thing which does not proceed from any cauſe, or does not ſubſiſt by virtue of any other being, conſidered as its cauſe; in which ſenſe, God alone is *abſolute. Abſolute*, in this ſenſe, is ſynonymous with *independent*, and ſtands oppoſed to *dependent*.

ABSOLUTE alſo denotes a thing's being free from conditions or limitations; in which ſenſe, the word is ſynonymous with *unconditional.* We ſay, an *abſolute* decree, *abſolute* promiſe, *abſolute* obedience.

ABSOLUTE Government, that wherein the prince is left ſolely to his own will, being not limited to the obſervance of any laws except thoſe of his own diſcretion.

ABSOLUTE Equation, in aſtronomy, is the aggregate of the optic and eccentric equations. The apparent inequality of a planet's motion ariſing from its not being equally diſtant from the earth at all times, is called its optic equation, and would ſubſiſt even if the planet's real motion were uniform. The eccentric inequality is cauſed by the planet's motion being uniform. To illuſtrate which, conceive the ſun to move, or to appear to move, in the circumference of a circle, in whoſe centre the earth is placed. It is manifeſt, that if the ſun moves uniformly in this circle, it muſt appear to move uniformly to a ſpectator on the earth, and in this caſe there will be no optic nor eccentric equation: but ſuppoſe the earth to be placed out of the centre of the circle, and then, though the ſun's motion ſhould be really uniform, it would not appear to be ſo, being ſeen from the earth; and in this caſe there would be an optic equation, without an eccentric one. Imagine farther, the ſun's orbit to be not circular, but elliptic, and the earth in its focus; it will be as evident that the ſun cannot appear to have an uniform motion in ſuch ellipſe: ſo that his motion will then be ſubject to two equations, the optic and the eccentric.

ABSOLUTE Number, in algebra, is any pure number ſtanding in any equation without the conjunction of literal characters; as $2x+36=48$; where 36 and 48 are abſolute numbers, but 2 is not, as being joined with the letter x.

ABSOLUTION, in civil law, is a ſentence whereby the party accuſed is declared innocent of the crime laid to his charge.—Among the Romans, the ordinary method of pronouncing judgment was this: after the cauſe had been pleaded on both ſides, the præco uſed the word *dixerunt*, q. d. they have ſaid what they had to ſay; then three ballots were diſtributed to each judge, marked as mentioned under the article A; and as the majority fell of either mark, the accuſed was *abſolved* or condemned, &c. If he were abſolved, the prætor diſmiſſed him with *videtur non feciſſe*, or *jure videtur feciſſe*.

ABSOLUTION, in the canon law, is a juridical act, whereby the prieſt declares the ſins of ſuch as are penitent remitted.—The Romaniſts hold abſolution a part of the ſacrament of penance: the council of Trent, ſeſſ. xiv. cap. iii. and that of Florence, in the decree *ad Armenos*, declare the form or eſſence of the ſacrament to lie in the words of *abſolution*, I abſolve thee of thy ſins. The *formula* of abſolution, in the Romiſh church, is abſolute: in the Greek church, it is deprecatory; and in the churches of the reformed, declarative.

ABSOLUTION is chiefly uſed among Proteſtants for a ſentence whereby a perſon who ſtands excommunicated is releaſed or freed from that puniſhment.

ABSORBENT, in general, any thing poſſeſſing the faculty of *abſorbing*, or ſwallowing up another.

ABSORBENT Medicines, teſtaceous powders, as chalk, crab-eyes, &c. which are taken inwardly for drying up or abſorbing any acid or redundant humours in the ſtomach or inteſtines. They are likewiſe applied outwardly to ulcers or ſores with the ſame intention.

ABSORBENT Veſſels, a name given promiſcuouſly to the lacteal veſſels, lymphatics, and inhalent arteries. See ANATOMY.

Naturaliſts ſpeak of the like abſorbents in plants, the fibrous or hairy roots of which are as a kind of vaſa abſorbentia, which attract and imbibe the nutritious juices from the earth. See PLANTS.

ABSORBING, the ſwallowing up, ſucking up, or imbibing, any thing: thus black bodies are ſaid to abſorb the rays of light; luxuriant branches, to abſorb or waſte the nutritious juices which ſhould feed the fruit of trees, &c.

ABSORPTION, in the animal œconomy, is the power whereby the abſorbent veſſels imbibe the juices, &c.

ABSORPTIONS of the Earth, a term uſed by Kircher and others for the ſinking in of large tracts of land by means of ſubterranean commotions, and many other accidents.

Pliny tells us, that in his time the mountain Cymbotus, with the town of Eurites, which ſtood on its ſide, were wholly abſorbed into the earth, ſo that not the leaſt trace of either remained; and he records the like fate of the city Tantalis in Magneſia, and after it of the mountain Sypelus, both thus abſorbed by a violent opening of the earth. Galanis and Garnatus, towns once famous in Phœnicia, are recorded to have met the ſame fate; and the vaſt promontory, called *Phlegium*, in Ethiopia, after a violent earthquake in the night-time, was not to be ſeen in the morning, the whole having diſappeared, and the earth cloſed over it. Theſe and many other hiſtories, atteſted by the authors of greateſt credit among the ancients, abundantly prove the fact in the earlier ages; and there have not been wanting too many inſtances of more modern date. *Kircher's Mund. Subter*. p. 77. See EARTH and EARTHQUAKE.

ABSORUS, Apsorus, Absyrtis, Absyrtides, Apsyrtides, Apsyrtis, and Absyrtium, (Strabo, Mela, Ptolemy;) iflands in the Adriatic, in the gulf of Carnero; fo called from Abfyrtus, Medea's brother, there flain. They are either one ifland, or two, feparated by a narrow channel, and joined by a bridge; and are now called *Cherfo* and *Ofero*.

ABSTEMII, in church-hiftory, a name given to fnch perfons as could not partake of the cup of the eucharift on account of their natural averfion to wine. Calvinifts allow thefe to communicate in the fpecies ot bread only, touching the cup with their lip; which, on the other hand, is by the Lutherans deemed a profanation.

ABSTEMIOUS, is properly underftood of a perfon who refrains abfolutely from all ufe of wine.

The hiftory of Mr Wood, in the Medic. Tranf. vol. ii. p. 261. art. 18. is a very remarkable exemplification of the very beneficial alterations which may be effected on the human body by a ftrict courfe of abftemioufnefs.

The Roman ladies, in the firft ages of the republic, were all enjoined to be abftemious; and that it might appear, by their breath, whether or no they kept up to the injunction, it was one of the laws of the Roman civility, that they fhould kifs their friends and relations whenever they accofted them.

ABSTEMIUS (Laurentius) a native of Macerata, profeffor of belles lettres in Urbino, and librarian of duke Guido Ubaldo, under the pontificate of Alexander VI. He wrote, 1. Notes on moft difficult paffages of ancient authors. 2. Hecatomythium, *i. e.* A collection of an 100 fables, &c. which have been often printed with thofe of Æfop, Phædrus, Gabrias, Avienus, &c.

ABSTERGENT medicines, thofe employed for refolving obftructions, concretions, &c. fuch as foap, &c.

ABSTINENCE, in a general fenfe, the act or habit of refraining from fomething which we have a propenfion to or find pleafure in.—Among the Jews, various kinds of abftinence were ordained by their law. Among the primitive Chriftians, fome denied themfelves the ufe of fuch meats as were prohibited by that law, others looked upon this abftinence with contempt; as to which, St Paul gives his opinion, Rom. xiv. 1—3. The council of Jerufalem, which was held by the Apoftles, enjoined the Chriftian converts to abftain from meats ftrangled, from blood, from fornication, and from idolatry. Abftinence, as prefcribed by the gofpel, is intended to mortify and reftrain the paffions, to humble our vicious natures, and by that means raife our minds to a due fenfe of devotion. But there is another fort of abftinence, which may be called *ritual*, and confifts in abftaining from particular meats at certain times and feafons. It was the fpiritual monarchy of the weftern world which firft introduced this ritual abftinence; the rules of which were called *rogations;* but grofsly abufed from the true nature and defign of fafting.—In England, abftinence from flefh has been enjoined by ftatute even fince the reformation, particularly on Fridays and Saturdays, on vigils, and on all commonly called *fifh-days*. The like injunctions were renewed under Q. Elizabeth: but at the fame time it was declared, that this was done not out of motives of religion, as if there were any difference in meats; but in favour of the confumption of fifh, and to multiply the number of fifhermen and mariners, as well as fpare the ftock of fheep. The great faft, fays St Auguftin, is to abftain from fin.

Abstinence is more particularly ufed for a fpare diet, or a flender parfimonious ufe of food, below the ordinary ftandard of nature. The phyficians relate wonders of the effects of abftinence in the cure of many diforders, and protracting the term of life. The noble Venetian, Cornaro, after all imaginable means had proved vain, fo that his life was defpaired of at 40, recovered, and lived to near 100, by mere dint of abftinence; as he himfelf gives the account. It is indeed furprifing to what a great age the primitive Chriftians of the eaft, who retired from the perfecutions into the deferts of Arabia and Egypt, lived, healthful and cheerful, on a very little food. Caffian affures us, that the common rate for 24 hours was 12 ounces of bread, and mere water: with this St Anthony lived 105 years; James the Hermit 104; Arfenius, tutor of the Emperor Arcadius, 120; S. Epiphanius, 115; Simeon the Stylite, 112; and Romauld, 120. Indeed, we can match thefe inftances of longevity at home. Buchanan writes, that one Laurence preferved himfelf to 140 by force of temperance and labour; and Spotfwood mentions one Kentigern, afterwards called S. Mongah or Mungo, who lived to 185 by the fame means. Other inftances fee under the article Longevity.—Abftinence, however, is to be recommended only as it means a proper regimen; for in general it muft have bad confequences when obferved without a due regard to conftitution, age, ftrength, &c. According to Dr Cheyne, moft of the chronical difeafes, the infirmities of old age, and the fhort lives of Englifhmen, are owing to repletion; and may be either cured, prevented, or remedied by abftinence: but then the kinds of abftinence which ought to obtain, either in ficknefs or health, are to be deduced from the laws of diet and regimen.

Among the brute creation, we fee extraordinary inftances of long abftinence. The ferpent-kind, in particular, bear abftinence to a wonderful degree. We have feen rattle-fnakes that had fubfifted many months without any food, yet ftill retained their vigour and fiercenefs. Dr Shaw fpeaks of a couple of ceraftes, (a fort of Egyptian ferpents), which had been kept five years in a bottle clofe corked, without any fort of food, unlefs a fmall quantity of fand wherein they coiled themfelves up in the bottom of the veffel may be reckoned as fuch: yet when he faw them, they had newly caft their fkins, and were as brifk and lively as if juft taken. But it is even natural for divers fpecies to pafs four, five, or fix months every year, without either eating or drinking. Accordingly, the tortoife, bear, dormoufe, ferpent, &c. are obferved regularly to retire, at thofe feafons, to their refpective cells, and hide themfelves, fome in the caverns of rocks or ruins; others dig holes under ground; others get into woods, and lay themfelves up in the clefts of trees; others bury themfelves under water, &c. And thefe animals are found as fat and flefhy after fome months abftinence as before.—Sir G. Ent* weighed his tortoife feveral years fucceffively, at its going to earth in October, and coming out again in March; and found, that, of four pounds, four

* Phil. Tranf. nº 194.

four ounces, it only used to lose about one ounce.—Indeed, we have instances of men passing several months as strictly abstinent as other creatures. In particular, the records of the Tower mention a Scotchman imprisoned for felony, and strictly watched in that fortress for six weeks: in all which time he took not the least sustenance; for which he had his pardon. Numberless instances of extraordinary abstinence, particularly from morbid causes, are to be found in the different periodical Memoirs, Transactions, Ephemerides, &c.—It is to be added, that, in most instances of extraordinary human abstinence related by naturalists, there were said to have been apparent marks of a texture of blood and humours, much like that of the animals abovementioned. Though it is no improbable opinion, that the air itself may furnish something for nutrition. It is certain, there are substances of all kinds, animal, vegetable, &c. floating in the atmosphere, which must be continually taken in by respiration. And that an animal body may be nourished thereby, is evident in the instance of vipers; which if taken when first brought forth, and kept from every thing but air, will yet grow very considerably in a few days. So the eggs of lizards are observed to increase in bulk, after they are produced, though there be nothing to furnish the increment but air alone; in like manner as the eggs or spawn of fishes grow and are nourished with the water. And hence, say some, it is that cooks, turnspit-dogs, &c. though they eat but little, yet are usually fat. See FASTING.

ABSTINENTS, or ABSTINENTES, a set of heretics that appeared in France and Spain about the end of the third century. They are supposed to have borrowed part of their opinions from the Gnostics and Manicheans, because they opposed marriage, condemned the use of flesh meat, and placed the Holy Ghost in the class of created beings. We have, however, no certain account of their peculiar tenets.

ABSTRACT, in a general sense, any thing separated from something else.

ABSTRACT Idea, in metaphysics, is a partial idea of a complex object, limited to one or more of the component parts or properties, laying aside or abstracting from the rest. Thus, in viewing an object with the eye, or recollecting it in the mind, we can easily abstract from some of its parts or properties, and attach ourselves to others: we can attend to the redness of a cherry, without regard to its figure, taste, or consistence. See ABSTRACTION.

ABSTRACT Terms, words that are used to express abstract ideas. Thus beauty, ugliness, whiteness, roundness, life, death, are abstract terms.

ABSTRACT Numbers, are assemblages of units, considered in themselves without denoting any particular and determined particulars. Thus 6 is an abstract number, when not applied to any thing; but, if we say 6 feet, 6 becomes a concrete number. See the article NUMBER.

ABSTRACT Mathematics, otherwise called *Pure Mathematics*, is that which treats of magnitude or quantity, absolutely and generally considered, without restriction to any species of particular magnitude; such are Arithmetic and Geometry. In this sense, abstract mathematics is opposed to mixed mathematics; wherein simple and abstract properties, and the relations of quantities primitively considered in pure mathematics, are applied to sensible objects, and by that means become intermixed with physical considerations; such are Hydrostatics, Optics, Navigation, &c.

ABSTRACT, in literature, a compendious view of any large work; shorter and more superficial than an abridgment.

ABSTRACTION, in general, the act of abstracting, or the state of being abstracted.

ABSTRACTION, in metaphysics, the operation of the mind when occupied by abstract ideas. A large oak fixes our attention, and abstracts us from the shrubs that surround it. In the same manner, a beautiful woman in a crowd, abstracts our thoughts, and engrosses our attention solely to herself. These are examples of real abstraction: when these, or any others of a similar kind, are recalled to the mind after the objects themselves are removed from our sight, they form what is called *abstract ideas*, or the mind is said to be employed in abstract ideas. But the power of abstraction is not confined to objects that are separable in reality as well as mentally: the size, the figure, the colour of a tree are inseparably connected, and cannot exist independent of each other; and yet we can mentally confine our observations to any one of these properties, neglecting or abstracting from the rest.

Abstraction is chiefly employed these three ways. First, When the mind considers any one part of a thing, in some respect distinct from the whole; as a man's arm, without the consideration of the rest of the body. Secondly, When we consider the *mode* of any substance, omitting the substance itself; or when we separately consider several modes which subsist together in one subject. This abstraction the geometricians make use of when they consider the length of a body separately, which they call *a line*, omitting the consideration of its breadth and thickness. Thirdly, It is by abstraction that the mind forms general or universal ideas; omitting the modes and relations of the particular objects whence they are formed. Thus, when we would understand a thinking being in general, we gather from our self-consciousness what it is to think; and, omitting those things which have a particular relation to our own minds, or to the human mind, we conceive a thinking being in general.

Ideas formed in this manner, which are what we properly call *abstract ideas*, become general representatives of all objects of the same kind; and their names applicable to whatever exists conformable to such ideas. Thus the idea of colour that we receive from chalk, snow, milk, &c. is a representative of all of that kind; and has a name given it, *whiteness*, which signifies the same quality wherever found or imagined.

ABSTRUSE, something deep, hidden, concealed, or far removed from common apprehensions, and therefore not easily understood; in opposition to what is obvious and palpable. Thus metaphysics is an abstruse science; and the doctrine of fluxions, and the method *de maximis et minimis*, are abstruse points of knowledge.

ABSURD, an epithet applied to any thing that opposes the human apprehension and contradicts a manifest truth. Thus, it would be absurd to say that 6 and 6 make only 10, or to deny that twice 6 make 12. When the term *absurd* is applied to actions, it has the same import as *ridiculous*.

ABSYNTHIUM. See ABSINTHIUM.

ABSYRTUS, in the heathen mythology, the fon of Æta and Hypfea, and the brother of Medea. The latter running away with Jafon, after her having affifted him in carrying off the golden fleece, was purfued by her father; when, to ftop his progrefs, fhe tore Abfyrtus in pieces, and fcattered his limbs in his way.

ABTHANES, a title of honour ufed by the ancient inhabitants of Scotland, who called their nobles *thanes*, which in the old Saxon fignifies *king's minifters;* and of thefe the higher rank were ftyled *abthanes*, and thofe of the lower *underthanes*.

ABUCCO, ABOCCO, or ABOCCHI, a weight ufed in the kingdom of Pegu. One abucco contains 12½ teccalis; two abuccos make a *giro* or *agire;* two *giri*, half a *biza;* and a *biza* weighs an hundred teccalis; that is, two pounds five ounces the heavy weight, or three pounds nine ounces the light weight of Venice.

ABUKESO, in commerce, the fame with ASLAN.

ABULFARAGIUS (Gregory), fon to Aaron a phyfician, born in 1226, in the city of Malatia, near the fource of the Euphrates in Armenia. He followed the profeffion of his father; and practifed with great fuccefs, numbers of people coming from the moft remote parts to afk his advice. However, he would hardly have been known at this time, had his knowledge been confined to phyfic: but he applied himfelf to the ftudy of the Greek, Syriac, and Arabic languages, as well as philofophy and divinity; and he wrote a hiftory which does honour to his memory. It is written in Arabic, and divided into dynafties. It confifts of ten parts, being an epitome of univerfal hiftory from the creation of the world to his own time. Dr Pocock publifhed it with a Latin tranflation in 1663; and added, by way of fupplement, a fhort continuation relating to the hiftory of the eaftern princes.

ABUNA, the title given to the archbifhop or metropolitan of Abyffinia. See ABYSSINIA.

ABUNDANT NUMBER, in arithmetic, is a number, the fum of whofe aliquot parts is greater than the number itfelf. Thus the aliquot parts of 12, being 1, 2, 3, 4, and 6, they make, when added together, 16. An abundant number is oppofed to a *deficient* number, or that which is greater than all its aliquot parts taken together; as 14, whofe aliquot parts are 1, 2, and 7, which make no more than ten: and to a *perfect* number, or one to which its aliquot parts are equal, as 6, whofe aliquot parts are 1, 2, and 3.

ABUNDANTIA, a heathen divinity, reprefented in ancient monuments under the figure of a woman with a pleafing afpect, crowned with garlands of flowers, pouring all forts of fruit out of a horn which fhe holds in her right hand, and fcattering grain with her left, taken promifcuoufly from a fheaf of corn. On a medal of Trajan, fhe is reprefented with two cornucopiæ.

ABU SAID, (Ebn Aljaptu), fultan of the Moguls, fucceeded his father anno 717 of the hegira. He was the laft monarch of the race of Jenghizkhan; and after his death, which happened the fame year that Tamerlane was born, the empire was made a fcene of blood and defolation.

ABUS, (anc. geog.), a river of Britain, formed by the confluence of the Ure, the Derwent, Trent, &c. falling into the German fea, between Yorkfhire and Lincolnfhire, and forming the mouth of the Humber.

ABUSE, an irregular ufe of a thing, or the introducing fomething contrary to the true intention thereof. In grammar, to apply a word *abufively*, or in an *abufive* fenfe, is to mifapply or pervert its meaning.—A permutation of benefices, without the confent of the bifhop, is termed *abufive*, and confequently null.

ABUTILON, in botany, the trivial name of feveral fpecies of the fida. See SIDA.

ABYDOS, (anc. geog.), anciently a town built by the Milefians in Afia, on the Hellefpont, where it is fcarce a mile over, oppofite to Seftos on the European fide. Now both called the *Dardanelles*. Abydos lay midway between Lampfacus and Ilium, famous for Xerxes's bridge, (Herodotus, Virgil); and for the loves of Leander and Hero, (Mufæus, Ovid); celebrated alfo for its oyfters, (Ennius, Virgil). The inhabitants were a foft, effeminate people, given much to detraction; hence the proverb, *Ne temere Abydum*, when we would caution againft danger, (Stephanus).

ABYDOS, (anc. geog.), anciently an inland town of Egypt, between Ptolemais and Diofpolis Parva, towards Syene; famous for the palace of Memnon and the temple of Ofiris. A colony of Milefians; (Stephanus.) It was the only one in the country into which the fingers and dancers were forbid to enter.

This city, reduced to a village under the empire of Auguftus, now prefents to our view only an heap of ruins without inhabitants; but to the weft of thefe ruins is ftill found the celebrated tomb of Ifmandes. The entrance is under a portico 60 feet high, and fupported by two rows of maffy columns. The immoveable folidity of the edifice, the huge maffes which compofe it, the hieroglyphics it is loaded with, ftamp it a work of the ancient Egyptians. Beyond it is a temple 300 feet long and 145 wide. Upon entering the monument we meet with an immenfe hall, the roof of which is fupported by 28 columns 60 feet high and 19 in circumference at the bafe. They are 12 feet diftant from each other. The enormous ftones that form the ceiling, perfectly joined and incrufted, as it were, one in the other, offer to the eye nothing but one folid platform of marble 126 feet long and 26 wide. The walls are covered with hieroglyphics. One fees there a multitude of animals, birds, and human figures with pointed caps on their heads, and a piece of ftuff hanging down behind, dreffed in loofe robes that come down only to the waift. The fculpture, however, is clumfy; the forms of the body, the attitudes and proportions of the members, ill obferved. Amongft thefe we may diftinguifh fome women fuckling their children, and men prefenting offerings to them. Here alfo we meet with the divinities of India. Monfieur Chevalier, formerly governor of Chandernagore, who refided 20 years in that country, carefully vifited this monument on his return from Bengal. He remarked here the gods *Jaggrenat*, *Gonez*, and *Vechnou* or *Wiftnou*, fuch as they are reprefented in the temples of Indoftan.—A great gate opens at the bottom of the firft hall, which leads to an apartment 46 feet long by 22 wide. Six fquare pillars fupport the roof of it; and at the angles are the doors of four other chambers, but fo choaked up with rubbifh that they cannot now be entered. The laft hall, 64 feet long by 24 wide, has ftairs by which one defcends into the fubterraneous apartments of this grand edifice. The Arabs, in fearching after treafure, have

piled up heaps of earth and rubbiſh. In the part we are able to penetrate, ſculpture and hieroglyphics are diſcoverable as in the upper ſtory. The natives ſay that they correſpond exactly with thoſe above ground, and that the columns are as deep in the earth as they are lofty above ground. It would be dangerous to go far into thoſe vaults; for the air of them is ſo loaded with a mephitic vapour, that a candle can ſcarce be kept burning in them. Six lions heads, placed on the two ſides of the temple, ſerve as ſpouts to carry off the water. You mount to the top by a ſtaircaſe of a very ſingular ſtructure. It is built with ſtones incruſted in the wall, and projecting ſix feet out; ſo that being ſupported only at one end, they appear to be ſuſpended in the air. The walls, the roof, and the columns of this edifice, have ſuffered nothing from the injuries of time; and did not the hieroglyphics, by being corroded in ſome places, mark its antiquity, it would appear to have been newly built. The ſolidity is ſuch, that unleſs people make a point of deſtroying it, the building muſt laſt a great number of ages. Except the coloſſal figures, whoſe heads ſerve as an ornament to the capitals of the columns, and which are ſculptured *in relievo*, the reſt of the hieroglyphics which cover the inſide are carved in ſtone. To the left of this great building we meet with another much ſmaller, at the bottom of which is a ſort of altar. This was probably the ſanctuary of the temple of Oſiris.

ABYLA, (Ptolemy, Mela); one of Hercules's pillars on the African ſide, called by the Spaniards *Sierra de las Monas*, over againſt Calpe in Spain, the other pillar; ſuppoſed to have been formerly joined, but ſeparated by Hercules, and thus to have given entrance to the ſea now called the *Mediterranean:* the limits of the labours of Hercules, (Pliny.)

ABYSS, in a general ſenſe, denotes ſomething profound, and, as it were, bottomleſs. The word is originally Greek, αϐυσσος; compounded of the primitive α, and βυσσος, *q. d.* without a bottom.

Abyss, in a more particular ſenſe, denotes a deep maſs or fund of waters. In this ſenſe, the word is particularly uſed, in the Septuagint, for the water which God created at the beginning with the earth, which encompaſſed it round, and which our tranſlators render by *deep*. Thus it is that darkneſs is ſaid to have been on the face of the abyſs.

Abyss is alſo uſed for an immenſe cavern in the earth, wherein God is ſuppoſed to have collected all thoſe waters on the third day; which, in our verſion, is rendered the *ſeas*, and elſewhere the *great deep*. Dr Woodward, in his Natural Hiſtory of the Earth, aſſerts, That there is a mighty collection of waters incloſed in the bowels of the earth, conſtituting a huge orb in the interior or central parts of it; and over the ſurface of this water he ſuppoſes the terreſtrial ſtrata to be expanded. This, according to him, is what Moſes calls *the great deep*, and what moſt authors render *the great abyſs*. The water of this vaſt abyſs, he alleges, does communicate with that of the ocean, by means of certain hiatuſes or chaſms paſſing betwixt it and the bottom of the ocean: and this and the abyſs he ſuppoſes to have one common centre, around which the water of both is placed; but ſo, that the ordinary ſurface of the abyſs is not level with that of the ocean, nor at ſo great a diſtance from the centre as the other, it being for the moſt part reſtrained and depreſſed by the ſtrata of earth lying upon it: but wherever thoſe ſtrata are broken, or ſo lax and porous that water can pervade them, there the water of the abyſs aſcends; fills up all the clefts and fiſſures into which it can get admittance; and ſaturates all the interſtices and pores of the earth, ſtone, or other matter, all around the globe, quite up to the level of the ocean.

The exiſtence of an abyſs or receptacle of ſubterraneous waters, is controverted by Camerarius *; and defended by Dr Woodward chiefly by two arguments: the firſt drawn from the vaſt quantity of water which covered the earth in the time of the deluge; the ſecond, from the conſideration of earthquakes, which he endeavours to ſhow are occaſioned by the violence of the waters in this abyſs. A great part of the terreſtrial globe has been frequently ſhaken at the ſame moment; which argues, according to him, that the waters, which were the occaſion thereof, were coextended with that part of the globe. There are even inſtances of univerſal earthquakes; which (ſays he) ſhow, that the whole abyſs muſt have been agitated: for ſo general an effect muſt have been produced by as general a cauſe, and that cauſe can be nothing but the ſubterraneous abyſs †.

* Differt. Taur. Acta Erud. ſupp. tom. vi. p. 24.

† Hiſt. of the Earth. Journal de Scavans, tom. lviii. p. 393. Memoirs of Literature, tom. viii. p. 101, &c.

To this abyſs alſo has been attributed the origin of ſprings and rivers; the level maintained in the ſurfaces of different ſeas; and their not overflowing their banks. To the effluvias emitted from it, ſome even attribute all the diverſities of weather and change in our atmoſphere ‡. Ray ||, and other authors, ancient as well as modern, ſuppoſe a communication between the Caſpian ſea and the ocean by means of a ſubterranean abyſs: and to this they attribute it that the Caſpian does not overflow, notwithſtanding the great number of large rivers it receives, of which Kempfer reckons above 50 in the compaſs of 60 miles; tho', as to this, others ſuppoſe that the daily evaporation may ſuffice to keep the level.

‡ Holloway, Introd. to Woodward's hiſt. of the Earth. Acta Erud. 1727. p. 313.

|| Phyſico-Theol. Diſc. ii. c. 2. p. 76.

The different arguments concerning this ſubject may be ſeen collected and amplified in *Cockburn's Inquiry into the Truth and Certainty of the Moſaic Deluge*, p. 271, &c. After all, however, this amazing theory of a central abyſs is far from being demonſtrated: it will perhaps in ſeveral reſpects appear inconſiſtent with ſound philoſophy, as well as repugnant to the phenomena of nature. In particular, if we believe any thing like elective attraction to have prevailed in the formation of the earth, we muſt believe that the ſeparation of the chaos proceeded from the union of ſimilar particles. It is certain that reſt is favourable to ſuch operations of nature. As, therefore, the central parts of the earth were more immediately quieſcent than thoſe remote from the centre, it ſeems abſurd to ſuppoſe that the heavier and denſer bodies gave place to the more light and fluid; that the central part ſhould conſiſt of water only, and the more ſuperficial part of a cruſt or ſhell. Vid. *Whitehurſt's Inquiry into the original Formation of the Strata*, &c. See Deluge.

Abyss is alſo uſed to denote hell; in which ſenſe the word is ſynonymous with what is otherwiſe called *Barathrum*, *Erebus*, and *Tartarus*; in the Engliſh bible, the *bottomleſs pit*. The unclean ſpirits expelled by Chriſt,

Abyſs, Abyſſinia. Chirſt, begged, *ne imperaret ut in abyſſum irent*, according to the vulgate; *εις αβυσσον*, according to the Greek. Luke viii 31. Rev. ix. 1.

Abyss is more particularly uſed, in antiquity, to denote the temple of Proſerpine. It was thus called on account of the immenſe fund of gold and riches depoſited there; ſome ſay, hid under ground.

Abyss is alſo uſed in heraldry to denote the centre of an eſcutcheon. In which ſenſe a thing is ſaid to be bore in abyſs, *en abyſme*, when placed in the middle of the ſhield, clear from any other bearing: He bears azure, a flower de lis, in abyſs.

ABYSSINIA, by ſome called *Higher Ethiopia*, and by the Arabians *Al Habaſh*, is bounded on the north by Nubia; on the eaſt, by the Arabic gulph or Red Sea, and the kingdom of Adel; on the ſouth, by the kingdoms of Ajan, Alabo, and Gingiro; and on the weſt, by the kingdom of Goram, and part of Gingiro; and is divided into a great number of provinces. The principal river is the Nile, which has its ſource in this country; and the moſt conſiderable lake, that of Dambea, which diſcharges itſelf into the Nile, is about 700 miles in length, and 90 in breadth. The air is pretty temperate in the mountains, and therefore their towns and ſtrong holds are generally placed on them; but in the valleys it is hot and ſuffocating. The ſoil and face of the country is various. In ſome places there are nothing but rocks and profound caverns: in others, eſpecially where there are rivers, the land is exceedingly fruitful; and the banks of theſe ſtreams are bordered with flowers of various kinds, many of which are unknown in Europe. The torrents in the rainy ſeaſon waſh a great deal of gold from the mountains. This ſeaſon begins in May, when the ſun is vertical, or directly over their heads, and ends in September.—The country produces a great variety of animals, both tame and wild, ſuch as lions, tigers, rhinoceroſes, leopards, elephants, monkeys, ſtags, deer; horſes, camels, dromedaries, goats, cows, ſheep; likewiſe oſtriches, with a vaſt variety of other birds. In the rivers are crocodiles and the hippopotamus. Travellers mention alſo a peculiar kind of bees, ſmall, black, and without a ſting, which hive in the earth, and make honey and wax that are extremely white. The country is greatly infeſted with locuſts, which devour every thing that is green whereever they come.

The inhabitants are Moors, Pagans, Jews, and Chriſtians. The laſt was the reigning and eſtabliſhed religion when father Lobo viſited this country in 1624. This diverſity of people and religion is the reaſon that the kingdom, in different parts, is under different forms of government, and that their laws and cuſtoms are extremely various. Some of the people neither ſow their lands nor improve them; but live on milk and fleſh, and encamp like the Arabs, without any ſettled habitation. In ſome places they practiſe no rites of worſhip, though they believe that there dwells in the regions above a Being who governs the world: This deity they call *Oul*. In thoſe parts where Chriſtianity is profeſſed, it is ſo corrupted with ſuperſtitious errors, and ſo mingled with ceremonies borrowed from the Jews, that little beſide the name of Chriſtianity is to be found among them. (See the next article.)—They have two harveſts in the year; one in winter, which begins in May, and laſts, with great rigour, through the months of July, Auguſt, and September; and the other in ſpring. Every man who has a thouſand cows ſaves once a-year a day's milk, and makes a bath for his friends; ſo that to give an idea of a man's wealth, their common expreſſion is, *he bathes ſo many times a-year*. Their males marry about ten years old, and their females younger. Their marriage tie is ſo looſe, that they part whenever they find that they cannot live agreeably together.

Beſides the large towns, there are a great number of villages, which in ſome places are ſo thick ſown, that they look like one continued town: the houſes are very mean, being but one ſtory high, and built of ſtraw, earth, and lime. In moſt of the towns the houſes are ſeparated by hedges, which are always green, and mixed with flowers and fruit-trees at a certain diſtance from each other, which affords an agreeable proſpect.—The government is monarchical. The ſovereign has the title of Negus, and is an abſolute prince. When he is in camp, the tents are ſo regularly diſpoſed as to have the appearance of a city; and there is a captain over every diviſion, to prevent diſorders, and to execute juſtice.

The Abyſſines in general are of an olive complexion, tall, graceful, and well featured. Thoſe who are neither mechanics nor tradeſmen (which few of them are) nor tillers of the ground, are inured to bear arms, which are a head-piece, a buckler, a coat of mail, bows and arrows, darts, pikes capped with iron at both ends, a ſling, and a ſword: they have very few fire-arms, and thoſe were introduced by the Portugueſe. The habit of perſons of quality is a fine ſilken veſt, or fine cotton, with a kind of ſcarf. The citizens have the ſame habit, only coarſer. The common people have nothing but a pair of cotton drawers, and a ſcarf which covers the reſt of their body. The women are of a healthy conſtitution, active, and moderately handſome, having neither flat noſes nor thick lips like the negroes; and nature is ſo friendly, that they ſtand in little need of midwives, which is indeed the caſe of moſt countries in the torrid zone. They appear in public as in Europe, without being forbid the converſation of the men as among the Mahometans. Princeſſes of the royal blood are not permitted to marry foreigners: and when they take the air, they go in great ſtate, with 400 or 500 women attendants. Their language is the Ethiopic, which bears a great affinity with the Arabic; but particular provinces have a different dialect.

Manufactures are almoſt wholly wanting in this country; and the few trades which they have amongſt them are always conveyed from the father to the children. They ſeem indeed by their churches, and other ruinated places, to have had a knowledge of architecture. But the workmen were ſent for from other countries, and were forced to do all themſelves; ſo that when theſe fabrics were reared, eſpecially the imperial palace built by Peter Pais, a Portugueſe architect, the people flocked from all parts of Ethiopia to view it, and admired it as a new wonder of the world.—Gold, ſilver, copper, and iron, are the principal ores with which their mines abound in this extenſive part of Africa: but not above one third part is made uſe of by way of merchandize, or converted into money; of which they have little or no uſe in Abyſſinia. They cut their gold indeed into ſmall pieces for the pay of their troops, and for expences of the court, which is but a modern cuſtom among them;

Abyssinia. them; the king's gold, before the end of the 17th century, being laid up in his treasury in ingots, with intent to be never carried out, or never used in any thing but vessels and trinkets for the service of the palace. In the lieu of small money, they make use of rock salt as white as snow and as hard as stone. This is taken out of the mountain of Lasta, and put into the king's warehouses; where it is reduced into tablets of a foot long, and three inches broad, ten of which are worth about a French crown. When they are circulated in trade, they are reduced into still smaller pieces, as occasion requires. This salt is also applied to the same purpose as common sea-salt. With this mineral salt they purchase pepper, spices, and silk stuffs, which are brought to them by the Indians, in their ports in the Red Sea. Cardamums, ginger, aloes, myrrh, cassia, civet, ebony-wood, ivory, wax, honey, cotton, and linens of various sorts and colours, are merchandises which may be had from Abyssinia; to which may be added sugar, hemp, flax, and excellent wines, if these people had the art of preparing them. It is affirmed there are in this country the finest emeralds that are any where to be found; and, though they are found but in one place, they are there in great quantities, and some so large and so perfect as to be of almost inestimable value. The greatest part of the merchandises above mentioned, are more for foreign than inland trade. Their domestic commerce consists chiefly in salt, honey, buck-wheat, grey pease, citrons, oranges, lemons, and other provisions, with fruits and herbage necessary for the support of life. Those places that the Abyssian merchants frequent the most, who dare venture to carry their commodities by sea themselves, are Arabia Felix, and the Indies, particularly Goa, Cambaye, Bengal, and Sumatra. With regard to their ports on the Red Sea, to which foreign merchants commonly resort, the most considerable are those of Mette, Azum, Zajalla, Maga, Dazo, Patea, and Brava. The trade of the Abyssinians by land is inconsiderable. There are, however, bands of them who arrive yearly at Egypt, particularly at Cairo, laden with gold dust, which they bring to barter for the merchandises of that country, or of Europe, for which they have occasion. These cafilas or caravans, if we may be allowed thus to call a body of 40 or 50 poor wretches who unite together for their mutual assistance in their journey, are commonly three or four months on their route, traversing forests and mountains almost impassable, in order to exchange their gold for necessaries for their families, and return immediately with the greatest part of the merchandise on their backs. Frequently the Jews or Egyptians give them large credit; which may seem surprising, as they are beyond recourse if they should fail of payment. But experience has shown, that they have never abused the confidence reposed in them; and even in the event of death, their fellow-travellers take care of the effects of the deceased for the benefit of their families, but in the first place for the discharge of those debts contracted at Cairo.—It remains only to be observed, that one of the principal branches of trade of the Abyssines is that of slaves; who are greatly esteemed in the Indies and Arabia for the best, and most faithful, of all that the other kingdoms of Africa furnish. The Indian and Arabian merchants frequently substitute them as their factors; and, on account of their good services and integrity, not only often give them their liberty, but liberally reward them. Abyssinia.

Into this part of the globe the admission of travellers has been supposed extremely difficult, and their return from thence almost impracticable. A Scotch gentleman, however, of family and fortune, James Bruce, Esq; of Kinnaird, is known not only to have entered that country, but to have resided in it several years, and returned safe home, bringing with him many great curiosities. Soon after his return, the following notice was given by the Count de Buffon in an advertisement prefixed to the 3d volume of his History of Birds: "A new aid which I have received, and which I am anxious to announce to the public, is the free and generous communication which I had of the drawings and observations of James Bruce, Esq; of Kinnaird, who returning from Numidia, and the interior parts of Abyssinia, stopt in my house for several days, and made me a partaker of the knowledge which he had acquired in a tour no less fatiguing than hazardous. It filled me with the utmost astonishment to view the numerous drawings which he had made and coloured himself. He possesses the most perfect representations and descriptions of the birds, fishes, plants, edifices, monuments, dress, arms, &c. of different nations, all of them objects worthy of knowledge. Nothing has escaped his curiosity, and his talents have been proportioned to it. The English government will without doubt take proper measures for the publication of his work. That respectable nation, which has given a lead to all others in discoveries of every kind, will not fail to add to its glory, by speedily communicating to the world at large, those of this excellent traveller, who, not contented with accurate descriptions of nature, has made many important observations on the culture of different kinds of grains; on the navigation of the Red Sea; on the course of the Nile, from its mouth to its source, which he has been the first to discover; and on different particulars which may be of the highest utility to commerce and agriculture, those great arts which are but little known and ill cultivated. Yet, on these alone, the superiority of one nation over another does depend, and for ever will depend."

It is much to be regretted, that after so long an interval, this gentleman's discoveries have not yet made their appearance. The delay has given rise to various speculations. Doubts have even been entertained concerning the credibility of the reports that have transpired, or been gathered from his conversation. His honour and abilities, however, are too extensively known to be affected by such injurious insinuations. That he hath great talents for the information of his readers, appears by his dissertation on the Theban harp*, which Dr Burney hath inserted in the first volume of his History of Music, and in which are also mentioned several of the Abyssinian instruments. Mr Bruce, moreover, is said to have a great facility in learning languages, and talents for drawing; nor perhaps was any other traveller furnished with so large and scientific an apparatus of instruments. Add to all this, that he is possessed of a spirit and enterprise not easily to be equalled. The speedy production, therefore, of so interesting an account as he is capable of giving, of this almost unfrequented part of Africa, cannot but still be earnestly

* See the article HARP in this Dictionary.

Abyssinia. earnestly wished for. In the mean time, the following authentic anecdotes will not, it is presumed, be unacceptable, nor appear foreign to the present article.

Mr Bruce was appointed consul to Algiers, where he continued till 1765. In June 1764, he requested leave of absence from the secretary of state for the southern department, in order to make some drawings of antiquities near Tunis.

In Mr Bruce's last letter from Algiers to the same secretary (dated December 29. 1764), he alludes to another leave of absence, which he had likewise requested, that he might visit parts of the African continent. He explains himself no further in this letter; but it is believed that he proceeded considerably to the southward of Algiers, and made those very capital drawings of remains of Roman architecture, which many have seen since his return to Britain. Before he set out for Algiers, he informed some of his friends, that the making such excursions for these interesting purposes was his principal inducement for accepting the consulship.

How long he continued in Africa, the present writer has not had the opportunity of procuring information; but having intentions afterwards of visiting Palmyra, he was shipwrecked on the coast of Tunis, and plundered of every thing by the barbarous inhabitants.

The most distressing part of the loss was probably that of his instruments, so necessary to a scientific traveller; and though he afterwards procured some of these, yet others (particularly a quadrant) could not be recovered. Mr Bruce, however, determining to repair this loss as soon as possible from France, so much nearer to him than England, was so fortunate as to be provided with a time-piece and quadrant from that quarter. Upon this occasion Lewis XV. presented him with an iron quadrant of four feet radius, as he had probably represented to the academy of sciences his want of such an instrument whilst he should be in Abyssinia: Mr Bruce brought back with him to England this cumbrous fellow-traveller, and, having put upon it an inscription to the following purport, is said to have presented it to the university of Glasgow: "With this instrument given by the king of France, Lewis XV. Mr Bruce proceeded to the sources of the Nile, it being carried on foot, upon mens shoulders, over the mountains of Abyssinia." This information was received from that eminent maker of instruments Mr Nairne.

Where and when Mr Bruce received the French instruments is not known; but as he was still bent on visiting Abyssinia, he gave a commission to Mr W. Russel, F. R. S. for a reflecting telescope, made by *Bird* or *Short*; a watch with a hand to point seconds, and the newest and completest English astronomical tables; all of which were to be sent to Mr Fremaux, and forwarded to him at Alexandria before August. On the 29th of March 1768, Mr Bruce was at Sidon on the coast of Syria, and wrote to Mr Russel from thence for the following additional instruments, viz. a twelve-feet reflecting telescope, to be divided into pieces of three feet, and joined with screws. This telescope was also accompanied by two thermometers and two portable barometers. Mr Bruce moreover informed Mr Russel, that he was going into a country (viz. Abyssinia) from which few travellers had returned; and wished Mr Russel, or his philosophical friends, would send him their desiderata, as he was entirely at their service. Mr Bruce added, that if he could not obtain admission into Abyssinia, he still would do his best in the cause of science on the eastern coast of the Red Sea.

As Mr Bruce had directed the instruments to be ready for him at Alexandria by the beginning of August 1768, it is probable that he reached Cairo about that time; from whence he proceeded to Abyssinia, by way of JEDDA, MAZAVA, and ARQUITO.

It is supposed that Mr Bruce did not continue long at Jedda, as he is said to have explored the coast on the east side as low as Mocha, during which drawings were taken of many curious fish in the Red Sea. Mr Bruce must also have entered Abyssinia, either at the latter end of 1768, or the very beginning of 1769, as he made an observation in that part of Africa on the 15th of January of that year.

In this perilous enterprise he was accompanied by a Greek servant (named *Michael*), and an Italian painter, who probably assisted in the numerous articles which might deserve representation, and who died of a flux before Mr Bruce's return to Cairo in 1773. Mr Bruce must at times also have been assisted by many others, as his instruments, apparatus for drawings, and other necessaries, from their weight and bulk could not be easily transported from place to place, and perhaps required beasts of burden. To these likewise must be added several medicines which enabled him to perform cures on the inhabitants, and probably occasioned the good reception he afterwards met with.

Such other particulars as happened to Mr Bruce, during his long residence in this unfrequented country, must be left to his own superior narrative; and it shall suffice, therefore, only to state, that he made a large number of observations to fix the situations of places, out of which 31 have been examined and computed by the astronomer royal. The first of these observations was made on the 10th of January 1769, and the last on the 5th of October 1772, from 30 to 38 degrees of east longitude from Greenwich, and from 12 to 28 degrees of north latitude. It need scarcely be said, therefore, that these observations, which include so large an extent of almost unknown country, must prove a most valuable addition to geography; and the more so, because the Portuguese, who first visited Abyssinia, give neither longitude nor latitude of any place in that empire; and Poncet only two latitudes, viz. those of Sennar and Giesum.

As Mr Bruce made the last of his observations on the 5th of October 1772, it is probable that he might then be on his return to Cairo, through Nubia and Upper Egypt, where he arrived on the 15th of January 1773, after an absence of more than four years; bringing back with him his Greek servant, named Michael.

Mr Bruce continued at Cairo four months, during which time he had daily intercourse with Mr Antes; the substance of a letter from whom will contain the principal confutation of Baron Tott, and others, who have been incredulous with regard to Mr Bruce's expected narrative.

2 Mr

Abyssinia.

Mr Antes was born of German parents, who were possessed of lands in the back settlements of Pensylvania; and having showed early abilities as a mechanic, removed to Europe, where he distinguished himself in the art of watch-making, which he learned without apprenticeship. Being a member of the church known by the name of *Unitas Fratrum*, and commonly called *Moravian*, he wished to be employed in their missions, and more especially that of the same persuasion established at Cairo, who always have desired to procure opportunities of instructing the Abyssinians.

Mr Bruce had left Cairo fifteen months before Mr Antes came there; and the intercourse, therefore, between them first took place on Mr Bruce's return in 1773.

Having given this account of Mr Bruce and Mr Antes's being first known to each other, we shall state the substance of some information received from the latter, who is now established at Fulneck near Leeds, after having resided eleven years at Cairo.

"That Mr Bruce left Cairo in 1768, and proceeded thence by way of Jeda, Mazava, and Arquico, into Abyssinia.

"That in 1771, a Greek came from Gondar (the capital) in Abyssinia, who had a draught from Mr Bruce on a French merchant at Cairo (named *Rosé*) for some hundreds of German crowns, which were paid immediately. This draught was accompanied by a letter from Mr Bruce, and was the first time that he had been heard of at Cairo since his departure in 1768.

"That after Mr Bruce's return to Cairo in 1773, Mr Antes saw a young Armenian and his father (who came likewise from Gondar) at Mr Pini's, an Italian merchant of Cairo, where they and Mr Bruce conversed in the Abyssinian language, and seemed glad to meet him again.

"That Mr Bruce returned to Cairo from Abyssinia by way of Nubia and Upper Egypt; which can be fully attested by the Franciscan friars who are established at Isne near Asyuwan, which latter is the highest town of Upper Egypt.

"That during Mr Bruce's stay at Cairo, which was not less than four months, no day passed without their seeing each other; which gave Mr Antes frequent opportunities of inquiring with regard to Abyssinia, concerning which he was particularly interested from a reason before stated.

"That Mr Antes likewise frequently conversed with Michael, Mr Bruce's Greek servant; who is stated to have by no means had a lively imagination, and who always agreed with the circumstances mentioned by his master, and more particularly in relation to their having visited the sources of the Nile; which the Baron Tott doubts of, from having had a conversation with this same Greek servant.

Mr Antes adds, "That Baron Tott staid but a few days at Cairo; and, from his short residence in that country, hath given several erroneous accounts relative to Egypt. Mr Antes, on the other hand, had almost daily conversations with Michael for several years, and often in relation to the sources of the Nile."

Lastly, "That after Mr Bruce left Cairo, Mr Antes had conversed with others who had known Mr Bruce in Abyssinia, and that he was there called *Maalim Jakube*, or Mr James."

After this state of facts, it is conceived that no one can entertain a reasonable doubt with regard to Mr Bruce's not only having visited, but resided long in Abyssinia; though it is remarkable that the Jesuits expressed the same doubts in relation to Poncet, who had continued there nearly as long as Mr Bruce. Poncet happened to be a layman; and the Jesuits, perhaps, would not approve of any narrative that did not come from father Benevent, who accompanied Poncet to Abyssinia, but unfortunately died there (*a*).

Driven, however, from this hold, the objectors will possibly retain their incredulity as to many particulars to be related.

The first of these is, the having visited the sources of the Nile; "which, from classical education, we cannot easily believe, as they were unknown to the ancients, though they had so great curiosity with regard to this discovery."

Many things, however, have been accomplished by travellers in modern times, which the ancients never could atchieve, and which may be attributed to their want of enterprise (as travellers at least), of languages, and lastly the not being able to procure credit when in a distant country. Mr Bruce could not have continued so long as he did in Abyssinia, unless he had drawn from Gondar upon a merchant established at Cairo.

The difficulty, however, with regard to reaching the sources of the Nile, arises principally from the uncivilized state of Abyssinia, unless the traveller hath a proper introduction (*b*). When once this is procured, all difficulties seem to cease, as we find by Lobo's (*c*) account of this same discovery, and likewise by Pon-

(*a*) It must be admitted, however, that we owe to the zeal of the Jesuits the best accounts we have both of China and Paraguay. Few laymen have been actuated so strongly for the promotion of geography and science as Mr Bruce; and we must therefore (upon the order of Jesuits being abolished) look up chiefly to the missionaries from the church of the Unitas Fratrum, who, though differing so totally in other respects, seem to have an equal ardour with the Jesuits for instructing the inhabitants of countries unfrequented by Europeans. Such missions are already established in West Greenland, the coast of Labrador, N. Lat. 56. the back settlements of Carolina and Pensylvania, in India, Bengal, and the Nicobar islands. Those established on the coast of Labrador send over yearly meteorological journals, which are communicated to the Royal Society. As for the dispute between Poncet and Maillet the French consul at Cairo, see Mod. Univ. Hist. vol. 6.

(*b*) The professing the knowledge of medicine was Poncet's introduction, and seems to have been that of Mr Bruce. Even in our own civilized country, how are quacks and mountebanks resorted to? And what an impression must Mr Bruce, with his magnificent and scientific apparatus, have made upon the inhabitants of such a country as Abyssinia?

(*c*) In Father Telles's compilation. See also Ludolf, who describes the sources from Gregory, who was a native of Abyssinia. Father Payz was the first who visited them, A. D. 1622. His account of this is said to be in the archives

cet's narrative, who was prevented by illness from visiting the very spot, but hath given an ample relation from an Abyssinian who had often been there. Poncet, moreover, had obtained leave from the emperor to make this journey, which he states as not being a distant one, and that the emperor hath a palace near the very sources.

If it be doubted whether Mr Bruce hath visited every source of the Nile, it may be answered, that perhaps no Englishman hath taken this trouble with regard to the sources of the Thames, which, like most other great rivers, is probably derived from many springs and rills in different directions.

The other objection which we have often heard, is, "That Mr Bruce hath mentioned in conversation, that the Abyssinians cut a slice from the living ox, esteeming it one of their greatest delicacies."

This sort of dainty, indeed, is not so considered in other parts of the globe; but every nation almost hath its peculiarities in the choice of their food. Do not we eat raw oysters within a second of their being separated from the shell? And do not we roast both them and lobsters whilst alive; the barbarity of which practice seems to equal that of the Abyssinians? Do not cooks skin eels whilst alive? And do not epicures crimp fish for the gratification of their appetites?

That the Abyssinians eat beef in a raw state, is agreed both by Lobo and Poncet; and the former says, *reeking* from the beast. Mr Antes, moreover, was told by a Franciscan monk, who went with the caravan from Abyssinia to Cairo (*d*), that he was witness of an ox being killed, and immediately devoured by the band of travellers.

One reason, perhaps, for this usage may be, the great heat of the climate, which will not permit meat to be kept a sufficient time to make it tender (as with us); and it is generally allowed, that a fowl, dressed immediately after it is killed, is in better order for eating than if it is kept four and twenty hours.

Is it therefore extraordinary, that an Abyssinian epicure may really find (or perhaps fancy) that a piece cut from the beast whilst alive, may be more tender, or have a better relish, than if it is previously killed by the butcher? To this may be added, that according to the information which has been received on this head, Mr Bruce's account of this practice is much misrepresented by the objectors, who suppose that the ox lives a considerable time after these pieces are cut from it. When these dainty bits, however, have been sent to the great man's table (and which are probably taken from the fleshy parts), the beast soon afterwards expires, when the first artery is cut, in providing slices for the numerous attendants.

Upon the whole, the not giving credit to a traveller, because he mentions an usage which is very different from ours (and is undoubtedly very barbarous), seems rather to argue ignorance than acuteness.

This brings to recollection the incredulity which was shown to another distinguished traveller, Dr Shaw; who having mentioned, in an Oxford common room, that some of the Algerines were fond of lion's flesh, never could obtain any credit afterwards from his brother-fellows of the same college, though many of them were learned men. It is well known, however, though Dr Shaw states this same circumstance in the publication of his travels, that he is cited with the greatest approbation in almost every part of Europe. Sir William Temple somewhere mentions, that a Dutch governor of Batavia, who lived much with one of the most considerable inhabitants of Java, could never obtain any credit from him after having mentioned, that in Holland water became a solid body. The traveller who first saw a flying fish probably told every one of this extraordinary circumstance as soon as he set his foot on shore, and was probably discredited with regard to the other particulars of his voyage.

The natural cause and progress of the incredulity which a traveller generally experiences, seems to be the following:

When he returns from a distant and little frequented country, every one is impatient to hear his narrative; from which, of course, he selects the more striking parts, and particularly the usages which differ most from our own. Some of the audience, disbelieving what the traveller hath mentioned, put questions to him which show their distrust. The traveller by this treatment becomes irritated, and answers some of them peevishly, others ironically, of which the interrogators afterwards take advantage to his prejudice. Nothing is more irritating to an ingenuous person than to find his assertions are disbelieved. This is commonly experienced in the cross examinations of almost every witness. To the distresses of the traveller on his return, we may add, the being often teased by very ignorant questions.

ABYSSINIAN, in ecclesiastical history, is used as the name of a sect, or heresy, in the Christian church, established in the empire of Abyssinia. The Abyssinians are a branch of the Copts or Jacobites; with whom they agree in admitting but one nature in Jesus Christ, and rejecting the council of Chalcedon: whence they are also called Eutychians, and stand opposed to the Melchites. They are only distinguished from the Copts, and other sects of Jacobites, by some peculiar national usages.—The Abyssinian sect or church is governed by a bishop or metropolitan styled *Abuna*, sent them by the Coptic patriarch of Alexandria residing at Cairo, who is the only person that ordains priests. The next dignity is that of Komos, or Hegumenas, who is a kind of arch-presbyter. They have canons also, and monks: the former of whom marry; the latter, at their admission, vow celibacy, but with a reservation: these, it is said, make a promise aloud, before their superior, to keep chastity; but add, in a low voice, *as you keep it*. The emperor has a kind of supremacy in ecclesiastical matters. He alone

archives of the College *de propaganda fide* at Rome. It is believed that there are many other curious particulars for the illustration of geography to be found in the same depository. Dr Shaw mentions, moreover, some papers of Lippi (who accompanied the French embassy into Abyssinia, A. D. 1704), which are to be found in the botanical library at Oxford.

(*d*) This points out another channel by which a traveller of enterprise may visit Abyssinia.

alone takes cogniſance of all eccleſiaſtical cauſes, except ſome ſmaller ones reſerved to the judges; and confers all benefices, except that of Abuna.—The Abyſſinians have at different times expreſſed an inclination to be reconciled to the ſee of Rome; but rather out of intereſt of ſtate than any other motive. The emperor David, or the queen regent on his behalf, wrote a letter on this head to pope Clement VII. full of ſubmiſſion, and demanding a patriarch from Rome to be inſtructed by: which being complied with, he publicly abjured the doctrine of Eutychius and Dioſcorus in 1626, and allowed the ſupremacy of the pope. Under the emperor Seltan Seghed all was undone again; the Romiſh miſſionaries ſettled there had their churches taken from them, and their new converts baniſhed or put to death. The congregation *de propaganda* have made ſeveral attempts to revive the miſſion, but to little purpoſe.—The doctrines and ritual of this ſectary form a ſtrange compound of Judaiſm, Chriſtianity, and ſuperſtition. They practiſe circumciſion; and are ſaid to extend the practice to the females as well as males: They obſerve both Saturday and Sunday ſabbaths: they eat no meats prohibited by the law of Moſes: women are obliged to the legal purifications: and brothers marry their brothers wives, &c. On the other hand, they celebrate the epiphany with peculiar feſtivity, in memory of Chriſt's baptiſm; when they plunge and ſport in ponds and rivers; which has occaſioned ſome to affirm that they were baptized anew every year. Among the ſaints-days is one conſecrated to Pilate and his wife; by reaſon Pilate waſhed his hands before he pronounced ſentence on Chriſt, and his wife deſired him to have nothing to do with the blood of that juſt perſon. They have four lents: the great one commences ten days earlier than ours, and is obſerved with much ſeverity, many abſtaining therein even from fiſh, becauſe St Paul ſays there is one kind of fleſh of men, and another of fiſhes. They allow of divorce, which is eaſily granted among them, and by the civil judge; nor do their civil laws prohibit polygamy itſelf. They have at leaſt as many miracles and legends of ſaints as the Romiſh church; which proved no ſmall embarraſſment to the Jeſuit miſſionaries, to whom they produced ſo many miracles, wrought by their ſaints, in proof of their religion, and thoſe ſo well circumſtantiated and atteſted, that the Jeſuits were obliged to deny miracles to be any proof of a true religion; and in proof hereof to allege the ſame arguments againſt the Abyſſinians, which Proteſtants in Europe allege againſt Papiſts. They pray for the dead, and invoke ſaints and angels; have ſo great a veneration for the virgin, that they charged the Jeſuits with not rendering her honour enough. Images in painting they venerate; but abhor all thoſe in relievo, except the croſs. They hold that the ſoul of man is not created; becauſe, ſay they, God finiſhed all his work on the ſixth day. They admit the apocryphal books, and the canons of the apoſtles, as well as the apoſtolical conſtitutions, for genuine. Their liturgy is given by Alvarez, and in Engliſh by Pagit.

ACA, ACE, or ACON, a town of Phœnicia, on the Mediterranean; afterwards called *Ptolemais;* now *Acre*.

ACACALOTL, the Braſilian name of a bird called by ſome *corvus aquaticus*, or the water-raven: properly, the pelicanus carbo, or corvorant. See PELICANUS.

ACACIA, EGYPTIAN THORN, or BINDING BEAN-TREE, in botany, a ſpecies of Mimoſa, according to Linnæus; tho' other botaniſts make it a diſtinct genus. See MIMOSA.

The flowers of a ſpecies of the *acacia* are uſed by the Chineſe in making that yellow, which we ſee bears waſhing in their ſilks and ſtuffs, and appears with ſo much elegance in their painting on paper. The method is this:

They gather the flowers before they are fully open; theſe they put into a clean earthen veſſel over a gentle heat, and ſtir them continually about, as they do the tea-leaves, till they become dryiſh and of a yellow colour; then to half a pound of the flowers they add three ſpoonfuls of fair water, and after that a little more, till there is juſt enough to hold the flowers incorporated together: they boil this for ſome time, and the juice of the flowers mixing with the water, it becomes thick and yellow; they then take it from the fire, and ſtrain it through a piece of coarſe ſilk. To the liquor they add half an ounce of common alum, and an ounce of calcined oyſter-ſhells reduced to a fine powder. All is then well mixed together; and this is the fine laſting yellow they have ſo long uſed.

The dyers of large pieces uſe the flowers and ſeeds of the *acacia* for dying three different ſorts of yellow. They roaſt the flowers, as before obſerved; and then mix the ſeeds with them, which muſt be gathered for this purpoſe when full ripe: by different admixture of theſe, they give the different ſhades of colour, only for the deepeſt of all they give a ſmall mixture of Brazil wood.

Mr Geoffroy attributes the origin of bezoar to the ſeeds of this plant; which being brouſed by certain animals, and vellicating the ſtomach by their great ſourneſs and aſtringency, cauſe a condenſation of the juices, till at length they become coated over with a ſtony matter, which we call BEZOAR.

Falſe ACACIA. See ROBINIA.

Three-thorned ACACIA, or *Honey-locuſt*. See GLEDISTIA.

ACACIA, in the Materia Medica, the inſpiſſated juice of the unripe fruit of the *Mimosa Nilotica*.

This juice is brought to us from Egypt, in roundiſh maſhes, wrapt up in thin bladders. It is outwardly of a deep brown colour, inclining to black; inwardly of a reddiſh or yellowiſh brown; of a firm conſiſtence, but not very dry. It ſoon ſoftens in the mouth, and diſcovers a rough, not diſagreeable taſte, which is followed by a ſweetiſh reliſh. This inſpiſſated juice entirely diſſolves in watery liquors; but is ſcarce ſenſibly acted on by rectified ſpirit.

Acacia is a mild aſtringent medicine. The Egyptians give it in ſpitting of blood, in the quantity of a dram, diſſolved in any convenient liquor; and repeat this doſe occaſionally: they likewiſe employ it in collyria for ſtrengthening the eyes, and in gargariſms for quinſeys. Among us, it is little otherwiſe uſed than as an ingredient in mithridate and theriaca, and is rarely met with in the ſhops. What is uſually ſold for the Egyptian acacia, is the inſpiſſated juice of unripe ſloes: this is harder, heavier, of a darker colour, and ſomewhat ſharper taſte, than the true ſort. See the next article.

German ACACIA, the juice of unripe ſloes inſpiſſated nearly

nearly to drinefs over a gentle fire, care being taken to prevent its burning. It is moderately aftringent, fimilar to the Egyptian acacia, for which it has been commonly fubftituted in the fhops. It is given in fluxes, and other diforders where ftyptic medicines are indicated, from a fcruple to a dram.

Acacia, among antiquaries, fomething refembling a roll or bag, feen on medals, as in the hands of feveral confuls and emperors. Some take it to reprefent a handkerchief rolled up, wherewith they made fignals at the games; others, a roll of petitions or memorials; and fome, a purple bag full of earth, to remind them of their mortality.

ACACIANS, in ecclefiaftical hiftory, the name of feveral fects of heretics; fome of which maintained, that the Son was only a fimilar, not the fame, fubftance with the Father; and others, that he was not only a diftinct, but a diffimilar, fubftance. Two of thefe fects had their denomination from Acacius bifhop of Cæfarea, who lived in the fourth century, and changed his opinions, fo as, at different times, to be head of both. Another was named from Acacius patriarch of Conftantinople, who lived in the clofe of the fifth century.

ACACIUS, firnamed Luscus, becaufe he was blind of one eye, was bifhop of Cæfarea in Paleftine, and fucceeded the famous Eufebius: he had a great fhare in the banifhment of Pope Liberius, and bringing Felix to the fee of Rome. He gave name to a fect, and died about the year 365. He wrote the life of Eufebius, and feveral other works.

Acacius (St.), bifhop of Amida, in Mefopotamia, in 420, was diftinguifhed by his piety and charity. He fold the plate belonging to his church, to redeem feven thoufand Perfian flaves who were ready to die with want and mifery; and giving each of them fome money, fent them home. Veranius, their king, was fo affected with this noble inftance of benevolence, that he defired to fee the bifhop; and this interview procured a peace between that Prince and Theodofius I.

There have been feveral other eminent perfons of the fame name; particularly, A martyr under the emperor Decius: A patrarch of Antioch, who fucceeded Bafil in 458, and died in 459: A bifhop of Miletum in the fifth century: A famous rhetorician in the reign of the emperor Julian: and, A patriarch of Conftantinople in the fifth century; who was ambitious to draw the whole power and authority of Rome by degrees to Conftantinople, for which he was delivered over irretrievably to the devil by Pope Felix III.

ACAD, or Achad, (anc. geog.) the town in which Nimrod reigned, called *Archad* by the feventy; fituated in Babylonia, to the eaftward of the Tigris.

ACADEMICIAN, or Academist, a member of an academy. See Academy in the modern fenfe.

ACADEMICS, or Academists, a denomination given to the cultivators of a fpecies of philofophy originally derived from Socrates, and afterwards illuftrated and enforced by Plato, who taught in a grove near Athens, confecrated to the memory of Academus, an Athenian hero; from which circumftance this philofophy received the name of *academical*. Before the days of Plato, philofophy had in a great meafure fallen into contempt. The contradictory fyftems and hypothefes which had fucceffively been urged upon the world were become fo numerous, that, from a view of this inconftancy and uncertainty of human opinions, many were led to conclude, that truth lay beyond the reach of our comprehenfion. Abfolute and univerfal fcepticifm was the natural confequence of this conclufion. In order to remedy this abufe of philofophy and of the human faculties, Plato laid hold of the principles of the academical philofophy; and, in his Phædo, reafons in the following manner. "If we are "unable to difcover truth, (fays he), it muft be owing "to two circumftances: either there is no truth in "the nature of things; or the mind, from a defect "in its powers, is not able to apprehend it. Upon "the latter fuppofition, all the uncertainty and fluc- "tuation in the opinions and judgments of mankind "admit of an eafy folution: Let us therefore be mo- "deft, and afcribe our errors to the real weaknefs "of our own minds, and not to the nature of things "themfelves. Truth is often difficult of accefs: in "order to come at it, we muft proceed with caution "and diffidence, carefully examining every ftep; and, "after all our labour, we will frequently find our great- "eft efforts difappointed, and be obliged to confefs our "ignorance and weaknefs."

Labour and caution in their refearches, in oppofition to rafh and hafty decifions, were the diftinguifhing characteriftics of the difciples of the ancient academy. A philofopher, poffeffed of thefe principles, will be flow in his progrefs; but will feldom fall into errors, or have occafion to alter his opinion after it is once formed. Vanity and precipitance are the great fources of fcepticifm: hurried on by thefe, inftead of attending to the cool and deliberate principles recommended by the academy, feveral of our modern philofophers have plunged themfelves into an abfurd and ridiculous kind of fcepticifm. They pretend to difcredit fubjects that are plain, fimple, and eafily comprehended; but give peremptory and decifive judgments upon things that evidently exceed the limits of our capacity. Of thefe, Berkley and Hume are the moft confiderable. Berkley denied the exiftence of every thing, excepting his own ideas. Mr Hume has gone a ftep further, and queftioned even the exiftence of ideas; but at the fame time has not hefitated to give determined opinions with regard to eternity, providence, and a future ftate, miraculous interpofitions of the Deity, &c. fubjects far above the reach of our faculties. In his effay on the academical or fceptical philofophy, he has confounded two very oppofite fpecies of philofophy. After the days of Plato, indeed, the principles of the firft academy were grofsly corrupted by Arcefilas, Carneades, &c. This might lead Mr Hume into the notion that the *academical* and *fceptical* philofophy were fynonymous terms. But no principles can be of a more oppofite nature than thofe which were inculcated by the old academy of Socrates and Plato, and the fceptical notions which were propagated by Arcefilas, Carneades, and the other difciples of the fucceeding academics.

ACADEMY, in antiquity, a garden, villa, or grove, fituated within a mile of Athens, where Plato and his followers held their philofophical conferences. It took its name from one Academus, or Ecademus, who was the original owner of it, and made it a kind of gymnafium: he lived in the time of Thefeus; and, after his death, it retained his name, and was confecrated to

his

his memory. Cimon embellifhed it with fountains, trees, and walks; but Sylla, during the fiege of Athens, employed thefe very trees in making battering engines againft the city. Cicero too had his villa, or place of retirement, near Puzzuoli, which he alfo named an *academy*, where he compofed his *Academical queftions*, and his book *De natura deorum*.

Academy, among the moderns, is moft commonly ufed to fignify a society of learned men, eftablifhed for the improvement of any art or fcience, and generally under the protection of a prince.

The firft Academy we read of, was eftablifhed by Charlemagne, at the inftigation of Alcuin. It was compofed of the chief wits of the court, the emperor himfelf being a member. In their academical conferences, every perfon was to give an account of what ancient authors he had read; and each even affumed the name of fome ancient author who pleafed him moft, or fome celebrated perfon of antiquity. Alcuin, from whofe letters we learn thefe particulars, took that of Flaccus, the firname of Horace: a young lord, named Augilbert, took that of Homer: Adelard, bifhop of Corbie, was called Auguftin: Riculfe, bifhop of Mentz, was Dametas; and the king himfelf, David. This fhows the miftake of fome modern writers, who relate, that it was in conformity with the genius of the learned men of thofe times, who were great admirers of Roman names, that Alcuin took the name of Flaccus Albinus.

Moft nations have now their academies; but Italy has the greateft number.—The French have many flourifhing academies, moft of which were eftablifhed by Lewis XIV.—We have but few in Britain; and thofe of chiefeft note go by a different name. See the article Society.

In giving an account of the principal Academies, it feems moft proper to arrange them according to their fubjects.

I. *Medical Academies*, as that of the Naturæ Curiofi in Germany; that founded at Palermo in 1645; another at Venice in 1701, which meets weekly in a hall near the grand hofpital; another at Geneva in 1715, in the houfe of M. Le Clerc. The colleges of phyficians at London and Edinburgh are alfo, by fome, ranked in the number of *Academies*.

The Academy of *Naturæ Curiofi*, called alfo the Leopoldine Academy, was founded in 1652 by Jo. Laur. Baufchius, a phyfician; who, in imitation of the Englifh, publifhed an invitation to all phyficians to communicate their extraordinary cafes; and, meeting with fuccefs, was elected prefident. Their works were at firft publifhed feparately; but in 1670 a new fcheme was laid for publifhing a volume of obfervations every year. The firft volume appeared in 1684, under the title of Ephemerides, and the work has been continued with fome interruptions and variations of the title, &c. In 1687, the emperor Leopold took the fociety under his protection, granting the members feveral privileges, particularly that their prefidents fhould be counts palatine of the holy Roman empire. This academy has no fixed refidence, nor regular affemblies: inftead of thefe, there is a kind of bureau, or office, firft eftablifhed at Breflau, and afterwards removed to Nuremberg, where letters, obfervations, &c. from correfpondents or members are taken in. The academy confifts of a prefident, two adjuncts or fecretaries, and colleagues or members without reftriction. The colleagues, at their admiffion, oblige themfelves to two things: firft, to choofe fome fubject out of the animal, vegetable, or mineral kingdom, to handle, provided it had not been treated of by any colleague before; the fecond, to apply themfelves to furnifh materials for the Annual Ephemerides. Each member to bear a fymbol of the academy; *viz.* a gold ring; whereon, inftead of a ftone, is a book open, and, on the face thereof, an eye; on the other fide the motto of the academy, *Nunquam otiofus*.

II. *Chirurgical Academies;* as that inftituted fome years ago, by public authority, at Paris: the members of which were not only to publifh their own and correfpondents obfervations and improvements; but to give an account of all that is publifhed on furgery, and to compofe a complete hiftory of the art, by their extracts from all the authors ancient and modern who have wrote on it. A queftion in furgery is annually propofed by the academy, and a gold medal of 200 livres value given to him who furnifhes the moft fatisfactory anfwer.

Academy of Surgery at Vienna, was inftituted fome years ago by the prefent emperor, under the direction of the celebrated Brambilla. In this there were at firft only two profeffors; and to their charge the inftruction of 130 young men was committed, 30 of whom had formerly been furgeons in the army. But of late the number both of the teachers and pupils has been confiderably increafed. Gabrieli has been appointed to teach pathology and practice; Boecking, anatomy, phyfiology, and phyfics; Streit, medical and pharmaceutical furgery; Hunczowfky, furgical operations, midwifery, and the chirurgia forenfis; and Plenk, chemiftry and botany. To thefe alfo has been added, Beindl, as profector and extraordinary profeffor of furgery and anatomy. Befides this, the emperor, with his ufual liberality, has provided a large and fplendid edifice in Vienna, which affords habitation both for the teachers, the ftudents, pregnant women, patients for clinical lectures, and fervants. He has alfo purchafed for the ufe of this academy a medical library, which is open every day; a complete fet of chirurgical inftruments; an apparatus for experiments in natural philofophy; a collection of natural hiftory; a number of anatomical and pathological preparations; a collection of preparations in wax brought from Florence; and a variety of other ufeful articles. Adjoining to the building alfo there is a good botanical garden.

Among other parts of this inftitution, three prize-medals, each of the value of 40 florins, are to be annually beftowed on thofe ftudents who return the beft anfwer to queftions propofed the year before. Thefe prizes are not entirely founded by the emperor, but are in part owing to the liberality of Brendellius the protochirurgus at Vienna.

III. *Ecclesiastical Academies;* as that at Bologna in Italy, inftituted in 1687, employed in the examination of the doctrine, difcipline, and hiftory, of each age of the church.

IV. *Cosmographical Academies;* as that at Venice, called the *Argonauts*. This was inftituted at the folicitation of F. Coronelli, for the improvement of geographical knowledge. Its defign was to publifh exact maps, both celeftial and terreftrial, as well particular

Academy. ticular as general, together with geographical, hiftorical, and aftronomical defcriptions. Each member, in order to defray the expence of fuch a publication, was to fubfcribe a proportional fum, for which they were to receive one or more copies of each piece publifhed. For this end three focieties are fettled; one under F. Moro, provincial of the Minorities in Hungary; another under the abbot Laurence au Rue Payenne au Marais; the third under F. Baldigiani, Jefuit, profeffor of mathematics in the Roman college. The device of this academy is the terraqueous globe, with the motto *Plus ultra;* and at its expence all the globes, maps, and geographical writings, of F. Coronelli have been publifhed.

V. *Academies of* SCIENCES.—Thefe comprehend fuch as are erected for improving natural and mathematical knowledge. They are otherwife called *Philofophical* and *Phyfical* academies.

The firft of thefe was inftituted at Naples, about the year 1560, in the houfe of Baptifta Porta. It was called the Academy *Secretorum Naturæ;* and was fucceeded by the Academy of *Lyncei*, founded at Rome by Prince Frederic Cefi, towards the end of that century. Several of the members of this academy rendered it famous by their difcoveries; among thefe was the celebrated Galileo. Several other academies were inftituted about that time, which contributed greatly to the advancement of the fciences; but none of them comparable to that of the *Lyncei*.

Some years after the death of Toricelli, the *Academy del Cimento* made its appearance, under the protection of Prince Leopold, afterwards Cardinal de Medicis. Redi was one of its chief members; and the ftudies purfued by the reft may be collected from thofe curious experiments publifhed in 1667, by their fecretary Count Laurence Magulotti, under the title of *Saggi di Naturali Efperienze;* a copy of which was prefented to the Royal Society, tranflated into Englifh by Mr Waller, and publifhed at London in 4to.

The *Academy degl'Inquieti*, afterwards incorporated into that of Della Tracia in the fame city, followed the example of that of Del Cimento. Some excellent difcourfes on phyfical and mathematical fubjects, by Geminiano Montenari, one of the chief members, were publifhed in 1667, under the title of *Perfieri Fifico Matematici*.

The *Academy of Roffano*, in the kingdom of Naples, was originally an academy of Belles Lettres, founded in 1540, and transformed into an Academy of Sciences in 1695 at the folicitation of the learned abbot Don Giacinto Gimma; who being made prefident, under the title of Promoter General thereof, gave them a new fet of regulations. He divided the academifts into the following claffes: Grammarians, Rhetoricians, Poets, Hiftorians, Philofophers, Phyficians, Mathematicians, Lawyers, and Divines, with a clafs apart for Cardinals and perfons of quality. To be admitted a member, a man muft have fome degrees in the faculty. The members are not allowed to take the title of *Academifts* in the beginning of their books, without a written permiffion from their prefident, which is not granted till the work has been examined by the cenfors of the academy; and the permiffion is the greateft honour the academy can confer, as they thereby adopt the work, and are anfwerable for it againft all criticifms that may be made upon it. To this law the prefident or promoter himfelf is fubject; and no academift is allowed to publifh any thing againft the writings of another without leave from the fociety.

Several other Academies of *Sciences* have been founded in Italy; but, for want of being fupported by princes, did not continue long. The lofs of them, however, was abundantly repaired by the inftitution of others ftill fubfifting; fuch as, the *Academy of Filarmonici* at Verona; of *Ricovatri* at Padua, where a learned difcourfe on the origin of fprings was delivered by Sig. Vallifnieri, firft profeffor of phyfic in the univerfity of that city, and which was afterwards printed. To the Academy of the *Muti de Reggio*, at Modena, the fame Sig. Vallifnieri prefented an excellent difcourfe on the fcale of created beings, fince inferted in his hiftory of the generation of man and animals printed at Venice in the year 1721.

F. Merfenne is faid to have given the firft idea of a philofophical academy in France, towards the beginning of the 17th century, by the conferences of naturalifts and mathematicians occafionally held at his lodgings; at which Gaffendi, Des Cartes, Hobbes, Roberval, Pafcal, Blondel, and others affifted. F. Merfenne propofed to each certain problems to examine, or certain experiments to be made. Thefe private affemblies were fucceeded by more public ones, formed by Mr Montmort, and Mr Thevenot the celebrated traveller. The French example animated feveral Englifhmen of diftinction and learning to erect a kind of philofophical academy at Oxford, towards the clofe of Oliver Cromwell's adminiftration; which, after the Reftoration, was erected into a Royal Society. See SOCIETY. The Englifh example, in its turn, animated the French. Lewis XIV. in 1666, affifted by the counfels of Mr Colbert, founded an academy of fciences at Paris, with a fufficient revenue to defray the charge of experiments, and falaries to the members.

Royal Academy of Sciences. After the peace of the Pyrenees, Lewis XIV. being defirous of eftablifhing the arts, fciences, and literature, upon a folid foundation, directed M. Colbert to form a fociety of men of known abilities and experience in the different branches, who fhould meet together under the king's protection, and communicate their refpective difcoveries. Accordingly Mr Colbert, having conferred with thofe who were at that time moft celebrated for their learning, refolved to form a fociety of fuch perfons as were converfant in natural philofophy and mathematics, to join to them other perfons fkilled in hiftory and other branches of erudition, along with thofe who were entirely engaged in what are called the *Belles Lettres*, grammar, eloquence, and poetry. The geometricians and natural philofophers were ordered to meet on Tuefdays and Saturdays, in a great hall of the king's library, where the books of mathematics and natural philofophy were contained; the learned in hiftory to affemble on Mondays and Thurfdays, in the hall where the books of hiftory were contained; and the clafs of Belles Lettres to affemble on Wednefdays and Fridays. All the different claffes were likewife ordered to meet together upon the firft Thurfday of every month; and, by their refpective fecretaries, make a report of the proceedings of the foregoing month.

In a fhort time, however, the claffes of Hiftory, Belles

Academies.

Belles Lettres, &c. were united to the *French* Academy, which was originally inſtituted for the improvement and refining the French language; ſo that the royal Academy contained only two claſſes, *viz.* that of natural philoſophy and mathematics.

In the 1696, the king, by a proclamation dated the 26th of January, gave this Academy a new form, and put it upon a more reſpectable footing.—It was now to be compoſed of four kinds of members, viz. *honorary*, *penſionary aſſociates*, and *eleves*. Theſe laſt were a kind of pupils, or ſcholars, each of whom was attached to one of the penſionaries. The firſt claſs to contain ten perſons, and each of the reſt twenty. The honorary academiſts to be all inhabitants of France; the penſionaries all to reſide at Paris; eight of the aſſociates allowed to be foreigners; and the eleves all to live at Paris. The officers to be, a preſident named by the king, out of the claſs of honorary academiſts; and a ſecretary and treaſurer to be perpetual. Of the penſionaries, three to be geometricians, three aſtronomers, three mechanics, three anatomiſts, three chemiſts, three botaniſts, and the remaining two to be ſecretary and treaſurer. Of the twelve aſſociates, two to apply themſelves to geometry, two to botany, and two to chemiſtry. The eleves to apply themſelves to the ſame kind of ſcience with the penſionaries they were attached to; and not to ſpeak, except when called by the preſident. No regular or religious to be admitted, except into the claſs of honorary academiſts; nor any perſon to be admitted either for aſſociate or penſionary, unleſs known by ſome conſiderable printed work, ſome machine, or other diſcovery. The aſſemblies were held on Wedneſdays and Saturdays, unleſs either of them happened to be a holiday, and then the aſſembly was held on the preceding day.—To encourage the members to purſue their labours, the king engaged not only to pay the ordinary penſions, but even to give extraordinary gratifications, according to the merit of their reſpective performances; furniſhing withal the expence of the experiments and other inquiries neceſſary to be made. If any member gave in a bill of charges of experiments he had made, or deſired the printing of any book, and brought in the charges of graving, the money was immediately paid by the king, upon the preſident's allowing and ſigning the bill. So, if an anatomiſt required live tortoiſes, for inſtance, for making experiments about the heart, &c. as many as he pleaſed were brought him at the king's charge. Their motto was, *Invenit et perfecit.*

In the year 1716, the duke of Orleans, then regent, made an alteration in their conſtitution; augmenting the number of honoraries, and of aſſociates capable of being foreigners, to 12; admitting regulars among ſuch aſſociates; and ſuppreſſing the claſs of eleves, as it appeared to be attended with ſome inconveniences, particularly that of making too great an inequality among the academiſts, and being productive of ſome miſunderſtandings and animoſities among the members. At the ſame time he created other two claſſes; one conſiſting of 12 adjuncts, who, as well as the aſſociates, were allowed a deliberative voice in matters relative to ſcience; and the other ſix free aſſociates, who were not attached to any particular ſcience, nor obliged to purſue any particular work.

Since its re-eſtabliſhment in 1699, this academy has been very exact in publiſhing, every year, a volume containing either the works of its own members, or ſuch memoirs as have been compoſed and read to the academy during the courſe of that year. To each volume is prefixed the hiſtory of the academy, or an extract of the memoirs, and, in general, of whatever has been read or ſaid in the academy; at the end of the hiſtory, are the eulogiums on ſuch academiſts as have died that year.—M. Rouille de Meſlay, counſellor to the parliament of Paris, founded two prizes, one of 2500, and the other of 2000 livres, which are alternately diſtributed by the parliament every year; the ſubject for the firſt muſt relate to phyſical aſtronomy, and thoſe for the latter to navigation and commerce.

Notwithſtanding the advantages which the members of this academy enjoy over others, in having their expences defrayed, and even being paid for their time and attendance, they have fallen under ſome imputations, particularly that of plagiariſm, or borrowing their neighbours inventions; but with what juſtice we do not ſay.

The French have alſo conſiderable academies in moſt of their great cities: as, at Montpelier, a royal academy of ſciences on the like footing as that at Paris, being as it were a counter part thereof; at Thoulouſe, an academy under the denomination of Lanterniſts; others at Niſmes, Arles, Lyons, Dijon, Bourdeaux, &c.

The Royal Academy of Sciences at Berlin was founded in 1700, by Frederic II. king of Pruſſia, on the model of that of England; excepting that, beſides natural knowledge, it likewiſe comprehends the Belles Lettres. In 1710, it was ordained that the preſident ſhall be one of the counſellors of ſtate, and nominated by the king. The members were divided into four claſſes; the firſt for proſecuting phyſics, medicine, and chemiſtry; the ſecond for mathematics, aſtronomy, and mechanics; the third for the German language and the hiſtory of the country; the fourth for oriental learning, particularly as it may concern the propagation of the goſpel among infidels. Each claſs to elect a director for themſelves, who ſhall hold his poſt for life. The members of any of the claſſes have free admiſſion into the aſſemblies of any of the reſt.

The great promoter of this inſtitution was the celebrated Mr Leibnitz, who accordingly was made the firſt director. The firſt volume of their tranſactions was publiſhed in 1710, under the title of *Miſcellanea Berolinenſia;* and though they received but few marks of the royal favour for ſome time, they continued to publiſh new volumes in 1723, 1727, 1734, and 1740. At laſt, however, Frederic III. the late king of Pruſſia, gave new vigour to this academy, by inviting to Berlin ſuch foreigners as were moſt diſtinguiſhed for their merit in literature, and encouraged his ſubjects to proſecute the ſtudy and cultivation of the ſciences by giving ample rewards; and thinking that the academy, which till that time had had ſome miniſter or opulent nobleman for its preſident, would find an advantage in having a man of letters at its head, he conferred that honour on M. Maupertuis. At the ſame time, he gave a new regulation to the academy, and took upon himſelf the title of its protector.

The academiſts hold two public aſſemblies annually; one in January, on the late king's birth-day; and the other

other in May, on the day of his accession to the throne. At the latter of these is given, as a prize, a gold medal of 50 ducats value: the subject for this prize is successively, natural philosophy, mathematics, metaphysics, and erudition.

The Imperial Academy of Sciences at Petersburgh was projected by Czar Peter the Great. That great monarch having, during his travels, observed the advantage of public societies for the encouragement and promotion of literature, formed the design of founding an academy of sciences at St Petersburgh. By the advice of Wolf and Leibnitz, whom he consulted on this occasion, the society was regulated, and several learned foreigners were invited to become members. Peter himself drew the plan, and signed it on the 10th of February 1724; but was prevented, by the suddenness of his death, from carrying it into execution. His decease, however, did not prevent its completion: for on the 21st of December 1725, Catharine I. established it according to Peter's plan; and on the 27th of the same month the society was first assembled. On the 1st of August 1726, Catharine honoured the meeting with her presence, when professor Bulfinger, a German naturalist of great eminence, pronounced an oration upon the advances made by the loadstone and needle for the discovery of the longitude.

The empress settled a fund of 4982 l. *per annum* for the support of the academy; and fifteen members, all eminent for their learning and talents, were admitted and pensioned, under the title of Professors, in the various branches of literature and science. The most distinguished of these professors were Nicholas and Daniel Bernoulli, the two De Lisles, Bulfinger, and Wolf.

During the short reign of Peter II. the salaries of the members were discontinued, and the academy was utterly neglected by the court; but it was again patronized by the empress Anne, who even added a seminary for the education of youth, under the superintendance of the professors. Both institutions flourished for some time under the direction of Baron Korf; but upon his death, towards the latter end of Anne's reign, an ignorant person being appointed president, many of the most able members quitted Russia. At the accession of Elizabeth, new life and vigour were again restored to the academy: the original plan was enlarged and improved; some of the most learned foreigners were again drawn to Petersburgh; and, what was considered as a good omen for the literature of Russia, two natives, Lomonosof and Rumovsky, men of genius and abilities, who had prosecuted their studies in foreign universities, were enrolled among its members. The annual income was increased to 10,659 l. and soon afterwards the new institution took place.

The present empress Catharine III. with her usual zeal for promoting the diffusion of knowledge, has taken this useful society under her more immediate protection. She has altered the court of directors greatly to the advantage of the whole body; she has corrected many abuses, and has infused a new spirit into their researches. By her Majesty's particular recommendation, the most ingenious professors have visited the various provinces of her vast dominions; and as the fund of the academy was not sufficient to supply the whole expence of these several expeditions, the empress bestowed a largess of 2000 l. which she has renewed as occasion has required.

The purpose and intent of these travels will appear from the instructions given by the academy to the several persons who were engaged in them. They were ordered to pursue their inquiries upon the different sorts of earths and waters; upon the best methods of cultivating the barren and desert spots; upon the local disorders incident to men and animals, and the most efficacious means of relieving them; upon the breeding of cattle, and particularly of sheep; on the rearing of bees and silk-worms; on the different places and objects for fishing and hunting; on minerals; on the arts and trades; and on forming a Flora Russica, or collection of indigenous plants: they were particularly instructed to rectify the longitude and latitude of the principal towns; to make astronomical, geographical, and meteorological observations; to trace the course of the rivers; to take the most exact charts; and to be very distinct and accurate in remarking and describing the manners and customs of the different people, their dresses, languages, antiquities, traditions, history, religion; and, in a word, to gain every information which might tend to illustrate the real state of the whole Russian empire.

In consequence of these expeditions, perhaps no country can boast, within the space of so few years, such a number of excellent publications on its internal state, on its natural productions, on its topography, geography, and history; on the manners, customs, and languages of the different people, as have issued from the press of this academy.

The first transactions of this society were published in 1728, and intitled, *Commentarii Academiæ Scientiarum Imperialis Petropolitanæ ad an.* 1726, with a dedication to Peter II. The publication was continued under this form until the year 1747, when its transactions were called *Novi Commentarii Academiæ*, &c. In 1777 the academy again changed the title into *Acta Academiæ Scientiarum Imperialis Petropolitanæ*, and likewise made some alteration in the arrangement and plan of the work. The papers, which had been hitherto published in the Latin tongue, are now written either in that language or French; and a preface is added, styled *Partie Historique*, which contains an account of its proceedings, meetings, admission of new members, and other remarkable occurrences. Of the Commentaries, 14 volumes were published: the first of the New Commentaries made its appearance in 1750, and the twentieth in 1776. Under the new title of *Acta Academiæ*, several volumes have been given to the public, and two are printed every year. These transactions abound with ingenious and elaborate disquisitions upon various parts of science and natural history, and which reflect the greatest honour upon their authors; and it may not be an exaggeration to assert, that no society in Europe has more distinguished itself for the excellence of its publications, and particularly in the more abstruse parts of the pure and mixed mathematics.

The academy is still composed, as at first, of fifteen professors, beside the president and director. Each of these professors has a house and an annual stipend from 200 l. to 600 l. Beside the professors, there are four adjuncts, who are pensioned, and who are present at the

Academies. the fittings of the fociety, and fucceed to the firft vacancies.—The direction of the academy is at prefent configned to the Princefs Dafhkof.

The building and apparatus of this academy are extraordinary. There is a fine library, confifting of 36000 curious books and manufcripts.—There is an extenfive mufeum, in which the various branches of natural hiftory, &c. are diftributed in different apartments: it is extremely rich in native productions, having been confiderably augmented with a variety of fpecimens collected by Pallas, Gmelin, Guldenftaedt, and other learned profeffors, during their late expeditions through the Ruffian empire. The ftuffed animals and birds occupy one apartment. The chamber of rarities, the cabinet of coins, &c. contain innumerable articles of the higheft curiofity and value. The fociety has this modeft motto, *Paulatim.*

The Academy of Sciences at Bologna, called the *Inftitute of Bologna,* was founded by count Marfigli in 1712, for the cultivating of phyfics, mathematics, medicine, chemiftry, and natural hiftory. Its hiftory is written by M. de Limiers, from memoirs furnifhed by the founder himfelf.

The Academy of Sciences at Stockholm, or *Royal Swedifh Academy,* owes its inftitution to fix perfons of diftinguifhed learning, amongft whom was the celebrated Linnæus: they originally met on the 2d of June 1739, formed a private fociety, in which fome differtations were read; and in the latter end of the fame year their firft publication made its appearance. As the meetings continued and the members increafed, the fociety attracted the notice of the king, and was, on the 31ft of March 1741, incorporated under the name of the Royal Swedifh Academy. Not receiving any penfion from the crown, it is only under the protection of the king, being directed, like our Royal Society, by its own members. It has now a large fund, which has chiefly arifen from legacies and other donations; but a profeffor of experimental philofophy, and two fecretaries, are ftill the only perfons who receive any falaries. Each of the members refident at Stockholm becomes prefident by rotation, and continues in office during three months. There are two fpecies of members, native and foreign: the election of the former is held in April, and of the latter in July: no money is paid at the time of admiffion. The differtations read at each meeting are collected and publifhed four times in the year; they are written in the Swedifh language, and printed in octavo, and the annual publications make a volume. The firft 40 volumes, which were finifhed in 1779, are called the Old Tranfactions; for in the following year the title was changed into that of New Tranfactions. The king is fometimes prefent at the ordinary meetings, and particularly at the annual affembly in April for the election of members. Any perfon who fends a treatife which is thought worthy of being printed, receives the tranfactions for that quarter *gratis,* and a filver medal, which is not efteemed for its value, being worth only three fhillings, but for its rarity and the honour conveyed by it. All the papers relating to agriculture are put forth feparately under the title of *Oeconomica acta.* Annual premiums, in money and gold medals, principally for the encouragement of agriculture and inland trade, are alfo diftributed by the academy. The fund for thefe prizes is fupplied from private donations. Academies.

The Royal Academy of Sciences at Copenhagen, owes its inftitution to the zeal of fix literati, whom Chriftian VI. in 1742, ordered to arrange his cabinet of medals. The count of Holftein was the firft prefident; and the fix perfons who firft formed the defign, were John Gram, Joachim Frederic Ramus, Chriftian Louis Scheid, Mark Woldickey, Eric Pontopidan, and Bernard Moelman. Thefe perfons occafionally meeting for that purpofe, extended their defigns; affociated with them others who were eminent in feveral branches of fcience; and forming a kind of literary fociety, employed themfelves in fearching into, and explaining the hiftory and antiquities of their country. The count of Holftein warmly patronized this fociety, and recommended it fo ftrongly to Chriftian VI. that, in 1743, his Danifh Majefty took it under his protection, called it the Royal Academy of Sciences, endowed it with a fund, and ordered the members to join to their former purfuits, natural hiftory, phyfics, and mathematics. In confequence of the royal favour, the members engaged with frefh zeal in their purfuits; and the academy has publifhed 15 volumes in the Danifh language, fome whereof have been tranflated into Latin.

The American Academy of Sciences, was eftablifhed in 1780 by the council and houfe of reprefentatives in the province of Maffachufet's Bay, for promoting the knowledge of the antiquities of America, and of the natural hiftory of the country; for determining the ufes to which its various natural productions might be applied; for encouraging medicinal difcoveries, mathematical difquifitions, philofophical inquiries and experiments, aftronomical, meteorological, and geographical obfervations, and improvements in agriculture, manufactures, and commerce; and, in fhort, for cultivating every art and fcience which may tend to advance the intereft, honour, dignity, and happinefs, of a free, independent, and virtuous people. The members of this academy are never to be more than 200, nor lefs than 40.

VI. *Academies or Schools of Arts;* as that at Peterfburgh, which was eftablifhed by the emprefs Elizabeth, at the fuggeftion of count Shuvalof, and annexed to the academy of fciences: the fund was L.4000 per annum, and the foundation for 40 fcholars. The prefent emprefs has formed it into a feparate inftitution, enlarged the annual revenue to L.12,000, and augmented the number of fcholars to 300; fhe has alfo conftructed, for the ufe and accommodation of the members, a large circular building, which fronts the Neva. The fcholars are admitted at the age of fix, and continue until they have attained that of 18: they are clothed, fed, and lodged, at the expence of the crown. They are all inftructed in reading and writing, arithmetic, the French and German languages, and drawing. At the age of 14 they are at liberty to choofe any of the following arts, divided into four claffes. 1. Painting in all its branches of hiftory, portraits, battles, and landfcapes; architecture; Mofaic; enamelling; &c. 2. Engraving on copperplates, feal-cutting, &c. 3. Carving in wood, ivory, and amber. 4. Watch-making, turning, inftrument-making, cafting ftatues in bronze and other metals, imitating gems and medals in pafte and

 other

other compositions, gilding, and varnifhing. Prizes are annually diftributed to thofe who excel in any particular art; and from thofe who have obtained four prizes, twelve are felected, who are fent abroad at the charge of the emprefs. A certain fum is paid to defray their travelling expences; and when they are fettled in any town, they receive an annual falary of L. 60, which is continued during four years. There is a fmall affortment of paintings for the ufe of the fcholars; and thofe who have made great progrefs are permitted to copy the pictures in the emprefs's collection. For the purpofe of defign, there are models in plafter of the beft antique ftatues in Italy, all done at Rome, of the fame fize with the originals, which the artifts of the academy were employed to caft in bronze.

The Royal Academy of Arts in London, was inftituted for the encouragement of *Defigning*, *Painting*, *Sculpture*, &c. &c. in the year 1768. This academy is under the immediate patronage of the king, and under the direction of 40 artifts of the firft rank in their feveral profeffions. It furnifhes, in winter, living models of different characters to draw after; and, in fummer, models of the fame kind to paint after. Nine of the ableft academicians are annually elected out of the 40, whofe bufinefs is to attend by rotation, to fet the figures, to examine the performance of the ftudents, and to give them neceffary inftructions. There are likewife four profeffors, of *Painting*, of *Architecture*, of *Anatomy*, and of *Perfpective*, who annually read public lectures on the fubjects of their feveral departments; befide a prefident, a council, and other officers. The admiffion to this academy is free to all ftudents properly qualified to reap advantage from the ftudies cultivated in it; and there is an annual exhibition of paintings, fculptures, and defigns, open to all artifts of diftinguifhed merit.

The Academy of Painting and Sculpture at Paris. This took its rife from the difputes that happened between the mafter painters and fculptors in that capital; in confequence of which, M. Le Brun, Sarazin, Corneille, and others of the king's painters, formed a defign of inftituting a particular academy; and, having prefented a petition to the king, obtained an arret dated Jan. 20. 1648. In the beginning of 1655, they obtained from cardinal Mazarin a brevet, and letters patent, which were regiftered in parliament; in gratitude for which favour, they chofe the cardinal for their protector, and the chancellor for their vice-protector. In 1663, by means of M. Colbert, they obtained a penfion of 4000 livres. The academy confifts of a protector; a vice-protector; a director; a chancellor; four rectors; adjuncts to the rectors; a treafurer; four profeffors, one of which is profeffor of anatomy, and another of geometry; feveral adjuncts and counfellors, an hiftoriographer, a fecretary, and two ufhers.

The Academy of Painting holds a public affembly every day for two hours in the afternoon, to which the painters refort either to defign or to paint, and where the fculptors model after a naked perfon. There are 12 profeffors, each of whom keeps the fchool for a month; and there are 12 adjuncts to fupply them in cafe of need. The profeffor upon duty places the naked man as he thinks proper, and fets him in two different attitudes every week. This is what they call *fetting the model*. In one week of the month he fets two models together, which is called *fetting the group*. The paintings and models made after this model, are called *academics*, or *academy-figures*. They have likewife a woman who ftands for a model in the public fchool. Every three months, three prizes for defign are diftributed among the *eleves* or difciples; two others for painting, and two for fculpture, every year.

There is alfo an Academy of Painting, Sculpture, &c. at Rome, eftablifhed by Lewis XIV. wherein thofe who have gained the annual prize at Paris are intitled to be three years entertained at the king's expence, for their further improvement.

The Academy of Architecture, eftablifhed by M. Colbert in 1671, confifting of a company of fkilful architects, under the direction of the fuperintendant of the buildings.

The Academy of Dancing, erected by Lewis XIV. with privileges above all the reft.

VII. *Academies of Law*; as that famous one at Beryta, and that of the Sitientes at Bologna.

VIII. *Academies of History*; as the *Royal Academy of Portuguefe Hiftory at Lifbon*. This academy was inftituted by king John V. in 1720. It confifts of a director, four cenfors, a fecretary, and 50 members; to each of whom is affigned fome part of the ecclefiaftical or civil hiftory of the nation, which he is to treat either in Latin or Portuguefe. In the church-hiftory of each diocefe, the prelates, fynods, councils, churches, monafteries, academies, perfons illuftrious for fanctity or learning, places famous for miracles or relics, muft be diftinctly related in twelve chapters. The civil hiftory comprifes the tranfactions of the kingdom from the government of the Romans down to the prefent time. The members who refide in the country are obliged to make collections and extracts out of all the regifters, &c. where they live. Their meetings to be once in 15 days.

A medal was ftruck by this academy in honour of their prince: the front of which was his effigy, with the infcription *Johannes* V. *Lufitanorum Rex*; and, on the reverfe, the fame prince is reprefented ftanding, and raifing Hiftory almoft proftrate before him, with the legend *Hiftoria Refurges*. Underneath are the following words in abbreviature: REGia ACADemia HISToriæ LUSITanæ, INSTITuta VI. Idus Decembris MDCCXX.

Academy of Suabian Hiftory at Tubingen, was lately eftablifhed by fome learned men, for publifhing the beft hiftorical writings, the lives of the chief hiftorians, and compiling new memoirs, on the feveral points and periods thereof.

IX. *Academies of Antiquities*; as that at Cortona in Italy, and at Upfal in Sweden. The firft is defigned for the ftudy of Hetrurian antiquities; the other for illuftrating the northern languages, and the antiquities of Sweden, in which notable difcoveries have been made by it. The head of the Hetrurian academy is called *Lucomon*, by which the ancient governors of the country were diftinguifhed. One of their laws is to give audience to poets only one day in the year; another is to fix their feffions, and impofe a tax of a differtation on each member in his turn.

The Academy of Medals and Infcriptions at Paris was fet on foot by M. Colbert, under the patronage of Lewis XIV. in 1663, for the ftudy and explanation of

of ancient monuments, and perpetuating great and memorable events, efpecially thofe of the French monarchy, by coins, relievos, infcriptions, &c. The number of members at firft was confined to four or five, chofen out of thofe of the French academy; who met in the library of Mr Colbert, from whom they received his majefty's orders. The days of their meetings were not determined; but generally they met on Wednefdays, efpecially in the winter feafon: but, in 1691, the king having given the infpection of this academy to M. de Pontchartrain comptroller general, &c. he fixed their meetings on Tuefdays and Saturdays.

By a new regulation, dated the 16th of July 1701, the academy was compofed of ten *honorary* members; ten *affociates*, each of whom had two declarative voices; ten *penfionaries;* and ten *eleves*, or pupils. They then met every Tuefday and Wednefday, in one of the halls of the Louvre; and had two public meetings yearly, one the day after Martinmas and the other the 16th after Eafter. The clafs of *eleves* has been fuppreffed, and united to the affociates. The king nominates their prefident and vice-prefident yearly; but their fecretary and treafurer are perpetual. The reft are chofen by the members themfelves, agreeably to the conftitutions on that behalf given them.

One of the firft undertakings of this academy, was to compofe, by means of medals, a connected hiftory of the principal events of Lewis XIV's reign: but in this defign they met with great difficulties, and of confequence it was interrupted for many years; but at length it was completed down to the advancement of the duke of Anjou to the crown of Spain.

In this celebrated work, the eftablifhment of the academy itfelf was not forgot. The medal on this fubject reprefents Mercury fitting, and writing with an antique ftylus on a table of brafs; he leans with his left hand upon an urn full of medals, and at his feet are feveral others placed upon a card: the legend, *Rerum geftarum fides;* and on the exergue, *Academia regia infcriptionum et numifmatum, inftituta* M.DC.LXIII. fignifying that the Royal Academy of Medals and Infcriptions, founded in 1663, ought to give to future ages a faithful teftimony of all great actions. Befides this work, we have feveral volumes of their memoirs; and their hiftory, written and continued by their fecretaries.

X. *Academies of* BELLES LETTRES, are thofe wherein eloquence and poetry are chiefly cultivated. Thefe are very numerous in Italy, and not uncommon in France.

The Academy of Umidi at Florence has contributed greatly to the progrefs of the fciences by the excellent Italian tranflations given, by fome of its members, of the ancient Greek and Latin hiftorians. Their chief attention is to the Italian poetry, at the fame time that they have applied themfelves to the polifhing of their language, which produced the *Academy la Crufca.*

The Academy of Humorifts, Umorifti, had its origin at Rome from the marriage of Lorenzo Marcini, a Roman gentleman; at which feveral perfons of rank were guefts; and, it being carnival time, to give the ladies fome diverfion, they took themfelves to the reciting of verfes, fonnets, fpeeches, firft *ex tempore*, and afterwards premeditately; which gave them the denomination of *Belli Humori.* After fome experience, coming more and more into the tafte of thefe exercifes, they refolved to form an Academy of Belles Lettres; and changed the title of *Belli Humori* for that of *Humorifti:* choofing for their device a cloud, which, after being formed of exhalations from the falt waters of the ocean, returns in a gentle fweet fhower; with this motto from Lucretius, *Redit agmine dulci.*

In 1690, the *Academy of Arcadi* was eftablifhed at Rome, for reviving the ftudy of Poetry and of the Belles Lettres. Befides moft of the politer wits of both fexes in Italy, this academy comprehends many princes, cardinals, and other ecclefiaftics; and, to avoid difputes about pre-eminence, all appear mafked after the manner of Arcadian fhepherds. Within ten years from its firft eftablifhment, the number of *Academifts* amounted to fix hundred. They hold affemblies feven times a-year in a mead or grove, or in the gardens of fome nobleman of diftinction. Six of thefe meetings are employed in the recitation of poems and verfes of the Arcadi refiding at Rome; who read their own compofitions; except ladies and cardinals, who are allowed to employ others. The feventh meeting is fet apart for the compofitions of foreign or abfent members.

This academy is governed by a Cuftos, who reprefents the whole fociety, and is chofen every four years, with a power of electing 12 others yearly for his affiftance. Under thefe are two fub-cuftodes, one vicar or pro-cuftos, and four deputies or fuperintendants, annually chofen. The laws of the fociety are immutable, and bear a near refemblance to the ancient model.

There are five manners of electing members. The firft is by *acclamation.* This is ufed when fovereign princes, cardinals, and ambaffadors of kings, defire to be admitted; and the votes are then given *viva voce.* The fecond is called *annumeration.* This was introduced in favour of ladies and academical colonies, where the votes are taken privately. The third, *reprefentation*, was eftablifhed in favour of colonies and univerfities, where the young gentry are bred; who have each a privilege of recommending one or two members privately to be balloted for. The fourth, *furrogation;* whereby new members are fubftituted in the room of thofe dead or expelled. The laft, *deftination;* whereby, when there is no vacancy of members, perfons of poetical merit have the title of Arcadi conferred upon them till fuch time as a vacancy fhall happen. All the members of this body, at their admiffion, affume new paftoral names, in imitation of the fhepherds of Arcadia. The academy has feveral colonies of Arcadi in different cities of Italy, who are all regulated after the fame manner.

XI. *Academies of* LANGUAGES; called, by fome, *Grammatical Academies:* as,

The Academy della Crufca at Florence, famous for its vocabulary of the Italian tongue, was formed in 1582, but fcarce heard of before the year 1584, when it became noted for a difpute between Taffo and feveral of its members. Many authors confound this with the Florentine academy. The difcourfes which Toricelli, the celebrated difciple of Galileo, delivered in the affemblies, concerning levity, the wind, the power of percuffion, mathematics, and military architecture, are a

proof that these academists applied themselves to things as well as words.

The Academy of Fructiferi had its rise in 1617, at an assembly of several princes and nobility of the country, who met with a design to refine and perfect the German tongue. It flourished long under the direction of princes of the empire, who were always chosen presidents. In 1668, the number of members arose to upwards of 900. It was prior in time to the French academy, which only appeared in 1629, and was not established into an academy before the year 1635. Its history is written in the German tongue by George Neumarck.

The French Academy, which had its rise from a meeting of men of letters in the house of M. Conrart, in 1629. In 1635, it was erected into an academy, by Cardinal Richlieu, for refining and ascertaining the French language and style.—The number of its members are limited to 40; out of whom a director, chancellor, and secretary, are to be chosen: the two former hold their post for two months, the latter is perpetual. The members of this academy enjoy several privileges and immunities, among which is that of not being obliged to answer before any court but that of the king's household. They meet three times a-week in the Louvre; at breaking up, forty silver medals are distributed among them, having on one side the king of France's head, and on the reverse, *Protecteur de l'Academie*, with laurel, and this motto, *A l'Immortalité*. By this distribution, the attendance of the *Academists* is secured, those who are present receiving the surplus otherwise intended for the absent. To elect or expel a member, at least 18 are required; nor can any be chosen unless he petition for it: by this expedient, the affront of refusals from persons elected is avoided. Religious are not admitted; nor can any nobleman, or person of distinction, be admitted on another footing than as a man of letters. None are to be expelled, except for base and dishonest practices; and there are but two instances of such expulsions, the first of M. Granier for refusing to return a deposit, the other of the Abbé Furetiere for plagiarism.——The design of this academy was to give not only rules, but examples, of good writing. They began with making speeches on subjects taken at pleasure, about 20 of which were printed. They met with great opposition from the parliament at their first institution; it being two years before the patents granted by the king would be registered. They have been severely satyrized, and their style has been ridiculed as enervating instead of refining the French language. They are also charged with having surfeited the world by flattery, and having exhausted all the topics of panegyric in praise of their founder; it being a duty incumbent on every member, at his admission, to make a speech in praise of the king, the cardinal, the chancellor Seguier, and the person in whose place he is elected. The most remarkable work of this academy is a dictionary of the French tongue; which, after 50 years spent in settling the words and phrases to be used in writing, was at last published in 1694.

The foundation of an *Academy* similar to the above, has been proposed at Petersburgh, by the learned princess Dashkof: it is to consist of 60 members. The plan has been approved by the empress, who has already given a fund for its support and establishment.

The Royal Spanish Academy at Madrid held its first meeting in July 1713, in the palace of its founder, the duke d'Escalona. It consisted at first of eight academists, including the duke; to which number 14 others were afterwards added, the founder being chosen president or director. In 1714, the king granted them his confirmation and protection. Their device is a crucible in the middle of the fire, with this motto, *Limpia, Fya, y da Esplendor;* "it purifies, fixes, and gives brightness." The number of members is limited to 24; the duke d'Escalona to be director for life, but his successors chosen yearly, and the secretary to be perpetual. Their object, as marked out by the royal declaration, was to cultivate and improve the national language: they were to begin with choosing carefully such words and phrases as have been used by the best Spanish writers; noting the low, barbarous, or obsolete ones; and composing a dictionary wherein these may be distinguished from the former.

XII. *Academies of Politics;* as that at Paris, consisting of six persons, who met at the Louvre, in the chamber where the papers relating to foreign affairs were lodged. But this academy proved of little service, as the kings of France were unwilling to trust any but their ministers with the inspection of foreign affairs.

For a further account of similar establishments, see the article Society.

Academy is also a term for schools and other seminaries of learning among the Jews, where their rabbins and doctors instructed their youth in the Hebrew language, and explained to them the Talmud and the secrets of the Cabbala: Those of Tiberias and Babylon have been the most noted.

The Romans had a kind of military academies, established in all the cities of Italy, under the name of *Campi Martis*. Here the youth were admitted to be trained for war at the public expence. The Greeks, beside academies of this kind, had military professors called *Tactici*, who taught all the higher offices of war, &c. &c.

Academy is often used with us to denote a kind of collegiate seminary, where youth are instructed in arts and sciences. There is one at Portsmouth for teaching navigation, drawing, &c.; another at Woolwich, forfortification, gunnery, &c.—Besides these, there are numerous academies, especially in London, for teaching mathematics, languages, writing, accounts, drawing, and other branches of learning.

The nonconformist ministers, &c. are bred up in private academies; as not approving the common university education. The principal of their academies are those in London, Daventry, and Warrington.

Academy is likewise a name given to a riding-school, where young gentlemen are taught to ride the great horse, &c. and the ground allotted is usually called the *Manege*.

Academy Figure, a drawing of a naked man or woman, taken from the life; which is usually done on paper with red or black chalk, and sometimes with pastils or crayons. See Academy, N° VI. par. 4. *supra*.

ACADIE, or Acady, in geography, a name formerly given to Nova Scotia, or New Scotland, in America. See *Nova Scotia*.

ACÆNA, in antiquity, a Grecian measure of length, being a ten feet-road, used in measuring their lands.

Acæna, in botany, a genus of the monogynia order belonging to the tetrandria clafs of plants; the characters of which are thefe: The *calyx* is a perianthium confifting of four leaves, which are ovate, concave, equal, and perfiftent; there is no *corolla:* The *ftamina* confifts of four equal middle-fized filaments oppofite to the calyx; the antheræ are quadrangular, twin, erect: The *piftillum* has an inverfely-ovate hifped germ; the ftylus is fmall, and inflected on one fide; and the ftigma is a fmall thickifh coloured membrane, divided into many fegments: The *pericarpium* is an inverfely-ovated dry one-celled berry covered with prickles bent backwards: The *feed* is fingle. There is only one fpecies, a native of Mexico.

ACAJOU, or Cashew-nut-tree. See Anacardium.

ACALANDRUS, a river falling into the bay of Tarentum, not far from the Metapontum, (Pliny, Strabo); now *Fiume de Rofeto.*

ACALEPTIC, in ancient profody, a complete verfe.

ACALYPHA, the Three-seeded Mercury, a genus of plants belonging to the monœcia monadelphia clafs. The characters of this genus are the following.—*Male flowers* crowded above the female ones: The *calyx* is a three or four-leaved-perianthium, the leaflets roundifh, concave, and equal: The *corolla* is wanting: The *ftamina* have from 6 to 18 filaments, which are fhort, crowded, and connected at the bafe; the antheræ are roundifh.—*Female flowers* fewer, placed beneath, and received into a large divided involucrum: The *calyx* is a perianthium, confifting of three leaflets, which are concave, converging, fmall, and perfiftent: No *corolla:* The *piftillum* has a roundifh germen; the ftyli are three, branchy, oftener tripartite, and long; the ftigmata are fimple: The *pericarpium* has a roundifh trifulcated trilocular capfule, the valvulets gaping two ways: The *feeds* are folitary, roundifh, and large.—This genus ranks in the 38th natural order, *Tricoccæ.* There are five fpecies, all natives of Virginia.

ACAMANTIS (the ancient name of the ifland of Cyprus), taken from one of its promontories fituated to the weft, and called *Acamas.* Teos in Ionia was alfo called thus from Acamus the founder.

ACAMAS, Acamantis (anc. geog.), the weft promontory of the ifland of Cyprus, from whence it took its ancient name; now Cape *Pifanio* or *Epifanio*, where formerly was a town of the fame name, now a village called *Crufocco.*

Acamas, fon of Thefeus, followed the reft of the Grecian princes to the fiege of Troy; and was deputed, with Diomedes, to the Trojans, in order to get Helen reftored. Laodice, Priam's daughter, fell in love with him, ftole a night with him, and had a fon by him called Munitus. He was one of the heroes who concealed themfelves in the wooden horfe. One of the tribes of Athens was called *Acamantides* from him, by the appointment of the oracle; and he founded a city in Phrygia Major, called *Acamantium.* Homer mentions two other heroes of this name; one a Thracian prince who came to fuccour Priam, another a fon of Antenor.

ACANACEOUS plants, fuch as are armed with prickles.

ACANGIS, that is, *Ravagers* or *Adventurers;* a name which the Turks give their huffars or light-troops, who are generally fent out in detachments to procure intelligence, harafs the enemy, or ravage the country.

ACANTHA, in botany, the prickle of any plant; in zoology, a term for the fpine or prickly fins of fifhes.

ACANTHABOLUS, in furgery, an inftrument for pulling thorns, or the like, out of the fkin.

ACANTHINE, any thing refembling or belonging to the herb acanthus. Acanthine garments, among the ancients, are faid to be made of the down of thiftles; others think they were garments embroidered in imitation of the acanthus.

ACANTHOPTERYGIOUS fishes, a term ufed by Linnæus and others for thofe fifhes whofe back-fins are hard, offeous, and prickly.

ACANTHOS, a town of Egypt, near Memphis, (Pliny); now *Bifalta.* Alfo a maritime town of Macedonia, to the weft of mount Athos, a colony of Andrians, (Thucydides, Ptolemy); now *Eriffo;* near which was fhown Xerxes's ditch, of feven ftadia, in order to feparate mount Athos from the continent, and convey his fhips, without doubling Athos, into the Singitic Bay. *Acanthos*, is alfo a town of Epirus.

ACANTHUS, bear's-breech, or *brank-urfine*, in botany: a genus of the angiofpermia order, belonging to the didynamia clafs of plants; and ranking in the 40th natural order, *Perfonatæ.* The generic characters are: The *calyx* is a perianthium with leaflets of three alternate pairs unequal and perfiftent: The *corolla* is one-petal'd and unequal; the tubus very fhort, clofed with a beard; no upper-lip, the under-one very large, flat, ftraight, very broad, three-lobed, and obtufe: The *ftamina* have four fubulated filaments fhorter than the corolla; the two fuperior rather longer, recurvate, and incurved at the top; the antheræ are oblong, compreffed, obtufe, lateral, parallel, and villous before: The *piftillum* has a conic germen; a filiform ftylus, the length of the ftamina; and two acute lateral ftigmata: The *perianthium* is an acutely-ovated bilocular capfule, with a lateral partition: The *feeds* one or two, flefhy and gibbous.

Species. 1. The mollis, or common bear's-breech, a native of Italy, is the fort that is ufed in medicine, and is fuppofed to be the *mollis acanthus* of Virgil; and the leaves are famous for having given rife to the capital of the Corinthian pillars. 2. The fpinofus, or prickly bear's-breech; the leaves of which are deeply jagged in very regular order, and each fegment is terminated with a fharp fpine, as are alfo the footftalks of the leaves and the empalement of the flower, which renders it troublefome to handle them. 3. Ilicifolius, or fhrubby bear's-breech, grows naturally in both the Indies. It is an evergreen fhrub, which rifes about four feet high; and is divided into many branches, garnifhed with leaves like thofe of the common holly, and armed with fpines in the fame manner: the flowers are white, and fhaped like thofe of the common acanthus, but fmaller. 4. The nigra, or Portugal bear's-breech, with fmooth finuated leaves of a livid green colour, was difcovered in Portugal by Dr Juffieu of the royal garden at Paris. 5. The middle bear's-breech, with entire leaves, having fpines on their border, is fuppofed to be the acanthus of Diofcorides.

Culture,

Culture, &c. They are all perennial plants. The firſt and ſecond ſpecies may be propagated either by ſeeds, or by offsets from the roots. The beſt way is to raiſe them from the ſeeds; which ſhould be ſown about the end of March, in a light ſoil. They are beſt dropped at diſtances into ſhallow drills, and covered three quarters of an inch with mould. When the plants are come up, the ſtrongeſt ſhould be marked, and the reſt ſhould be pulled up, that they may ſtand at a yard diſtance one from another. They require no other culture but to keep them clear from weeds. The third, fourth, and fifth ſorts, are propagated only by ſeeds; which, as they do not ripen in Europe, muſt be obtained from the places in which they grow naturally: the plants are ſo tender, that they cannot be preſerved out of the ſtove in this country.—The firſt ſpecies is the ſort uſed in medicine. All the parts of it have a ſoft ſweetiſh taſte, and abound with a mucilaginous juice: its virtues do not ſeem to differ from thoſe of althea and other mucilaginous plants.

Acanthus, in architecture, an ornament repreſenting the leaves of the acanthus, uſed in the capitals of the Corinthian and Compoſite orders.

ACAPULCO, a conſiderable town and port in Mexico, on the South Sea. It has a fine harbour, from whence a ſhip annually ſails to Manila in the Philippine iſlands, near the coaſt of China in Aſia; and another returns annually from thence with all the treaſures of the Eaſt Indies, ſuch as diamonds, rubies, ſapphires, and other precious ſtones; the rich carpets of Perſia; the camphire of Borneo; the benjamin and ivory of Pegu and Cambodia, the ſilks, muſlins, and calicoes, of the Mogul's country; the gold-duſt, tea, china-ware, ſilk, and cabinets, of China and Japan; beſides cinnamon, cloves, mace, nutmegs, and pepper; inſomuch that this ſingle ſhip contains more riches than many whole fleets. The goods brought to Acapulco are carried to the city of Mexico by mules and pack-horſes; and from thence to Vera Cruz on the North Sea, in order to be ſhipped for Europe. Acapulco itſelf is a ſmall place, conſiſting of about 2 or 300 thatched houſes. Ships arrive at the port by two inlets, ſeparated from each other by a ſmall iſland; the entrance into them in the day-time is by means of a ſea-breeze, as the ſailing out in the night-time is effected by a land-breeze. A wretched fort, 42 pieces of cannon, and a garriſon of 60 men, defend it. It is equally extenſive, ſafe, and commodious. The baſon which conſtitutes this harbour is ſurrounded by lofty mountains, which are ſo dry, that they are even deſtitute of water. The air here is hot, heavy, and unwholeſome; to which none can habituate themſelves, except certain negroes that are born under a ſimilar climate, or ſome mulattoes. This feeble and miſerable colony is crowded with a vaſt acceſſion to its numbers upon the arrival of the galleons; traders flocking here from all the provinces of Mexico, who come to exchange European toys, their own cochineal, and about ten millions * of ſilver for ſpices, muſlins, printed linens, ſilk, perfumes, and the gold works of Aſia. W. Long. 102. 29. N. Lat. 17. 30.

* L.437,500 Sterling.

ACARAI, a town of Paraguay in South America, built by the Jeſuits in 1624. Long. 116. 40. S. lat, 26′.

ACARAUNA, a ſmall American fiſh, called by our ſailors *the old-wife*. See Labrus.

ACARNANIA, the firſt country of Free Greece, or Greece Proper, bounded on the weſt by the Sinus Ambracius, and ſeparated from Ætolia by the river Achelous on the eaſt, and by the Sinus Ambracius from Epirus. The people were called *Acarnanes*, denoting perſons unſhorn; other Etolians, to the eaſt of the Achelous, being called *Curetes* (Homer) from being ſhorn. According to Lucian, they were noted for effeminacy and incontinence; hence the proverb, *Porcellus Acarnanius*. This country was famous for an excellent breed of horſes; ſo that Ακαρνικος ιππος, is a proverbial ſaying for a thing excellent in its kind. It is now called *la Carnia* and *il Deſpotato*.

ACARON, or Accaron, a town of Paleſtine, called *Ekron* in ſcripture. It was the boundary of the Philiſtines to the north; ſtood at ſome diſtance from the ſea, near Bethſhemeſh; and was famous for the idol of Baalzebub.

ACARUS, the Tick or Mite, a genus of inſects belonging to the order of aptera, or ſuch as have no wings. The acarus has eight legs; two eyes, one on each ſide of the head; and two jointed tentacula. The female is oviparous. Linnæus enumerates 35 ſpecies; of which ſome are inhabitants of the earth, ſome of waters; ſome live on trees, others among ſtones, and others on the bodies of other animals, and even under their ſkin. The deſcription of a few of the moſt remarkable will here ſuffice.

1. The ſiro, or cheeſe-mite, is a very minute ſpecies. To the naked eye, theſe mites appear like moving particles of duſt; but the microſcope diſcovers them to be perfect animals, having as regular a figure, and performing all the functions of life as perfectly, as creatures that exceed them many times in bulk. The principal parts of them are the head, the neck, and the body. The head is ſmall in proportion to the body; and has a ſharp ſnout, and a mouth that opens and ſhuts like a mole's. They have two ſmall eyes, and are extremely quickſighted; and when they have been once touched with a pin, you will eaſily perceive how cunningly they avoid a ſecond touch. Their legs are each furniſhed at the extremity with two little claws, with which the animal very nicely takes hold of any thing. The hinder part of the body is plump and bulky; and ends in an oval form, from which there iſſue out a few exceeding long hairs. Other parts of the body are alſo beſet with thin and long hairs. The males and females are eaſily diſtinguiſhed in theſe little animals. The females are oviparous, as the louſe and ſpider; and from their eggs the young ones are hatched in their proper form, without having any change to undergo afterwards. They are, however, when firſt hatched, extremely minute; and, in their growing to their full ſize, they caſt their ſkins ſeveral times. Theſe little creatures may be kept alive many months between two concave glaſſes, and applied to the microſcope at pleaſure. They are thus often ſeen *in coitu*, conjoined tail to tail; and this is performed by an incredibly ſwift motion. Their eggs, in warm weather, hatch in 12 or 14 days; but in winter they are much longer. Theſe eggs are ſo ſmall, that a regular computation ſhows, that 90 millions of them are not ſo large as a common pigeon's egg *. They are very voracious animals, and have often been ſeen to eat one another. Their manner of eating is by thruſting alternately one

* *Baker's Microſcope*, p. 187.

Acarus. jaw forward and the other backward, and in this manner grinding their food; and after they have done feeding, they seem to chew the cud.—There are several varieties of this species found in different substances besides cheese; as in malt-dust, flour, oatmeal, &c. Those in malt-dust and oatmeal are much nimbler than the cheese-mites, and have more and longer hairs. There are also a sort of wandering mites, which range wherever there is any thing they can feed on: They are often seen in the form of a white dust, and are not suspected to be living creatures.—The mite is called by authors, simply, *Acarus*. It is an animal very tenacious of life, and will live months without food. Mr Lewenhoek† had one which lived 11 weeks on the point of a pin, on which he had fixed it for examining by his microscope.

† *Arcan. Nat.* tom. iv. p. 368.

2. The sanguisugus. The hinder part of the abdomen is crenated, the scutellum is oval and yellowish, and the beak is trifid. It is a native of America, and sticks so fast on the legs of travellers, sucking their blood, that they can hardly be extracted.

3. The telarius is of a greenish yellow colour. It has a small sting or weapon, with which it wounds the leaves of plants, and occasions them to fold backward. They are very frequently to be met with in the autumn, inclosed in the folded leaves of the lime-tree.

4. The exulcerans, or itch-acarus, is a very small species: its body is of a figure approaching to oval, and lobated; the head is small and pointed; its colour is whitish, but it has two dusky semicircular lines on the back. It has long setaceous legs, but the two first are short. It is found in the pustules of the itch: authors in general have supposed that it causes that disease; but others observe, that if this were so, it would be found more universally in those pustules. It is more probable that these only make a proper nidus for it. See, however, the article Itch.

5. The batatas is of a blood-colour, and a little rough; the fore pair of legs are as long as the body. It inhabits the potatoes of Surinam.

6. The ovinus, or sheep-tick, has a flat body, of a roundish figure, but somewhat approaching to oval, and of a yellowish white colour, and has a single large round spot on the back: the anus is visible in the lower part of the body; the thorax is scarce conspicuous; the head is very small and black; the mouth is bifid: the antennæ are of a clavated figure, and of the length of the snout; the legs are short and black. It is common on sheep, and its excrements stain the wool green: it will live in the wool many months after it is shorn from the animal.

7. The coleoptratorum, or acarus of insects, is extremely minute: its body is round, reddish, and covered with a firm and hard skin; the head is very small, the neck scarce visible; the legs are moderately long, the anterior pair longer than the others; it has a whiteness about the anus. It is frequent on the bodies of many insects, which it infests, as the louse does others; it runs very swiftly: the humble-bee, and many other of the larger insects, are continually infested with it; but none so much as the common black beetle, which has thence been called the lousy beetle.

8. The baccarum, or scarlet tree-mite, is a small species: its body is roundish, and the back not at all flatted, as it is in many others; the skin is smooth, shining, and glossy; and the whole animal seems distended, and ready to burst; the colour is a bright red, but a little duskier on the sides than elsewhere: the head is very small, and the legs short; there is on each side a small dusky spot near the thorax, and a few hairs grow from different parts of the body. It is very common on trees, particularly on the currant, on the fruit of which we frequently see it running.

Acarus ‖ Acatery.

9. The longicornis, or red stone-acarus, is very small, and of a bright red colour; the body is round, and distended; the head is very small and pointed; the legs are moderately long, and of a paler red than the body: the antennæ are much longer than in any other species. It is frequent about old stone-walls and on rocks, and runs very nimbly. See Plate I.

10. The aquaticus is a small species: the body is of a figure approaching to an oval, and the back appears depressed; it is of a bright and strong scarlet colour. The head is small; the legs are moderately long and firm, and are of a paler red than the body. It is common in shallow waters, where it runs very swiftly along the bottom. Its diminutiveness hinders the beauty of its colours from being perceived, as they are not discernible without the microscope.

11. The holosericeus is a small species: its body is roundish, but a little approaching to oval; the back somewhat depressed: it is of a fine scarlet colour, and covered with a velvety down. The head is very small; the eyes are two, and very small; the legs are short and of a paler red, and there is a small black spot near the insertion of the anterior ones. It is very common under the surface of the earth, and sometimes on herbs and among hay. It is supposed to be poisonous if swallowed; but we do not seem to have any certain account of such an effect.

12. The longipes is the largest of the acarus kind: its body is roundish, of a dusky brown on the back, with a duskier spot of a rhomboidal figure near the middle of it; the belly is whitish; the legs are extremely long and slender. On the back part of the head there stands a little eminence, which has on it a kind of double crest, formed as it were of a number of minute spines: the eyes are small and black, and are two in number. It is very common in our pastures towards the end of summer. Ray and Lister call it *araneus crustatus longpipes*; Mouffet, *araneus longpipes*; and, notwithstanding its having but two eyes, it has been almost universally ranked among the spiders.

ACASTUS, in classic history, the son of Pelias king of Thessaly, and one of the most famous hunters of his time, married Hippolyta, who falling desperately in love with Peleus her son-in-law, and he refusing to gratify her wishes, she accused him to her husband of a rape; on which he slew them both.

ACATALECTIC, a term, in the ancient poetry, for such verses as have all their feet or syllables, in contradistinction to those that have a syllable too few.

ACATALEPSY, signifies the impossibility of comprehending something.—The distinguishing tenet of the Pyrrhonists was their asserting an absolute acatalepsy in regard to every thing.

ACATERY, or Accatry, anciently an officer of the king's household, designed for a check betwixt the clerks of the kitchen and the purveyors.

ACATHARSIA, in medicine, an impurity of the blood or humours.

ACATHISTUS, the name of a solemn hymn anciently sung in the Greek church on the Saturday of the fifth week of Lent, in honour of the Virgin, for having thrice delivered Constantinople from the invasions of the barbarous nations.

ACATIUM, in the ancient navigation, a kind of boat or pinnace used for military purposes. The *acatium* was a species of those vessels called *naves actuariæ, i. e.* such as were wrought with oars. It was sometimes made use of in battle. Strabo describes it as a privateer or pirate sloop.

ACAULIS, in botany, a term applied to certain plants, the flowers of which have no pedicle or stalk to support them, but rest immediately on the ground, such as the carline thistle, &c.

ACCA (St), bishop of Haguſtaldt, or Hexham, in Northumberland, succeeded Wilfrid in that see in 709. He ornamented his cathedral in a most magnificent manner: he furnished it also with plate and holy vestments; and erected a noble library, consisting chiefly of ecclesiastical learning, and a large collection of the lives of the saints, which he was at great pains to procure.—He was accounted a very able divine, and was famous for his skill in church-music. He wrote several pieces: particularly, *Passiones Sanctorum*, the Sufferings of the Saints: *Pro illustrandis scripturis, ad Bedam;* For explaining the scriptures, addressed to Bede. He died in 740, having enjoyed the see of Hexham 31 years, under Egbert king of the Northumbrians.

ACCALIA, in Roman antiquity, solemn festivals held in honour of Acca Laurentia, Romulus's nurse: they were otherwise called LAURENTALIA.

ACCAPITARE, in law, the act of becoming vassal of a lord, or of yielding him homage and obedience. Hence,

ACCAPITUM, signifies the money paid by a vassal upon his admission to a feu.

ACCAPITUM, in our ancient law, was used also to express the relief due to the chief lord. See RELIEF.

ACCEDAS AD CURIAM, in the English law, a writ lying, where a man has received, or fears, false judgment in an inferior court. It lies also for justice delayed, and is a species of the writ RECORDARE.

ACCELERATION, in mechanics, the increase of velocity in a moving body. Accelerated motion is that which continually receives fresh accessions of velocity. Acceleration stands directly opposed to *retardation*, which denotes a diminution of velocity.

ACCELERATION is chiefly used in physics, in respect of falling bodies, *i. e.* of heavy bodies tending towards the centre of the earth by the force of gravity. That natural bodies are accelerated in their descent, is evident from various considerations, both *à priori* and *posteriori*.—Thus, we actually find, that the greater height a body falls from, the greater impression it makes, and the more vehemently does it strike the subject plane, or other obstacle.

Various were the systems and opinions which philosophers produced to account for this acceleration. But the immediate cause of acceleration is now sufficiently obvious; the principle of gravitation, which determines the body to descend, determining it to be accelerated by a necessary consequence.

Suppose a body let fall from on high: the primary cause of its beginning to descend is doubtless the power of gravity; but when once the descent is commenced, that state becomes in some measure natural to the body; so that if left to itself, it would persevere in it for ever, even though the first cause should cease: as we see in a stone cast with the hand, which continues to move after it is left by the cause that gave it motion. But, beside the propensity to descend impressed by the first cause, and which of itself were sufficient to continue the same degree of motion, once begun, *in infinitum;* there is a constant accession of subsequent efforts of the same principle, gravity, which continues to act on the body already in motion, in the same manner as if it were at rest. Here, then, being a double cause of motion; and both acting in the same direction, viz. directly towards the centre of the earth; the motion they jointly produce must necessarily be greater than that of any one of them.—And the velocity thus increased having the same cause of increase still persisting, the descent must necessarily be continually accelerated.

The motion of a body ascending, or impelled upwards, is diminished or retarded from the same principle of gravity, acting in a contrary direction, in the same manner as a falling body is accelerated: See RETARDATION. A body thus projected upwards, rises till it has lost all its motion: which it does in the same time that a body falling would have acquired a velocity equal to that wherewith the body was thrown up. Hence the same body thrown up, will rise to the same height from which falling it would have acquired the velocity wherewith it was thrown up: And hence the heights which bodies thrown up with different velocities do ascend to, are to one another as the squares of those velocities.

ACCELERATION of Bodies on inclined Planes. The same general law obtains here as in bodies falling perpendicularly: the effect of the plane is to make the motion slower; but the inclination being every where equal, the retardation arising therefrom will proceed equally in all parts, at the beginning and the ending of the motion. See MECHANICS.

ACCELERATION of the Motion of Pendulums—The motion of pendulous bodies is accelerated in their descent; but in a less ratio than that of bodies falling perpendicularly. See MECHANICS and PENDULUM.

ACCELERATION of the Motion of Projectiles. See PROJECTILE.

ACCELERATION is also applied in the ancient astronomy, in respect of the fixed stars.—This acceleration was the difference between the revolution of the *primum mobile* and the solar revolution; which was computed at three minutes and 56 seconds.

ACCELERATION of the Moon, a term used to express the increase of the moon's mean motion from the sun, compared with the diurnal motion of the earth; so that it is now a little swifter than it was formerly. Dr Halley was the first who made this discovery; and he was led to it by comparing the ancient eclipses observed at Babylon with those observed by Albatennius in the ninth century, and some of his own time. He was not able to ascertain the quantity of this acceleration, because the longitudes of Bagdad, Alexandria, and Aleppo, where the observations were made, had not

been accurately determined. But ſince his time, the longitude of Alexandria has been aſcertained by Chazelles; and Babylon, according to Ptolemy's account, lies 50′ eaſt from Alexandria. From theſe *data*, Mr Dunthorne compared ſeveral ancient and modern eclipſes, with the calculations of them, by his own tables, and thereby verified Dr Halley's opinion; for he found that the ſame tables repreſent the moon's place more backward than her true place in ancient eclipſes, and more forward than her true place in later eclipſes; and thence juſtly inferred, that her motion in ancient times was ſlower; in later times quicker, than the tables give it. But he did not content himſelf with merely aſcertaining the fact; he proceeded to determine the quantity of the acceleration; and by means of the moſt ancient eclipſe of which any authentic account remains, obſerved at Babylon in the year before Chriſt 721, he concluded, that the obſerved beginning of this eclipſe was not above an hour and three-quarters before the beginning by the tables; and therefore the moon's true place could precede her place by computation but little more than 50′ of a degree at that time. Admitting the acceleration to be uniform, and the aggregate of it as the ſquare of the time, it will be at the rate of about 10′ in 100 years.

Dr Long attributes the acceleration above deſcribed to one or more of theſe cauſes: either, 1. The annual and diurnal motion of the earth continuing the ſame, the moon is really carried round the earth with a greater velocity than heretofore: or, 2. The diurnal motion of the earth, and the periodical revolution of the moon continuing the ſame, the annual motion of the earth round the ſun is a little retarded; which makes the ſun's apparent motion in the ecliptic a little ſlower than formerly; and, conſequently, the moon in paſſing from any conjunction with the ſun, ſpends leſs time before ſhe again overtakes the ſun, and forms a ſubſequent conjunction: in both theſe caſes, the motion of the moon from the ſun is really accelerated, and the ſynodical month actually ſhortened. Or, 3. The annual motion of the earth, and the periodical revolution of the moon continuing the ſame, the rotation of the earth round its axis is a little retarded: in this caſe, days, hours, minutes, ſeconds, &c. by which all periods of time muſt be meaſured, are of a longer duration; and conſequently the ſynodical month will appear to be ſhortened, though it really contains the ſame quantity of abſolute time as it always did. If the quantity of matter in the body of the ſun be leſſened by the particles of light continually ſtreaming from it, the motion of the earth round the ſun may become ſlower: if the earth increaſes in bulk, the motion of the moon round the earth may be quickened thereby. See ASTRONOMY.

ACCELERATOR, in anatomy, the name of two muſcles of the penis, which ſerve for ejecting the urine or ſemen. See ANATOMY, *Table of the Muſcles*.

ACCENDENTES, a lower order of miniſters in the Romiſh church, whoſe office is to light and trim the candles.

ACCENDONES, in Roman antiquity, a kind of gladiators, whoſe office was to excite and animate the combatants during the engagement. The orthography of the word is conteſted: the firſt edition of Tertullian, by Rhenanus, has it *accedones*; an ancient manuſcript, *accendones*. Aquinas adheres to the former, Pitiſcus to the latter. The origin of the word, ſuppoſing it *accendones*, is from *accendo*, I kindle; ſuppoſing it *accedones*, from *accedo*, I accede, am added to. The former places their diſtinguiſhing character in enlivening the combat by their exhortations and ſuggeſtions; the latter ſuppoſes them to be much the ſame with what among us are called *ſeconds*, among the Italians *patroni*: excepting that theſe latter only ſtand by to ſee the laws of the ſword duly obſerved, without intermeddling to give advice or inſtruction.

ACCENSI, in the Roman armies, certain ſupernumerary ſoldiers, deſigned to ſupply the places of thoſe who ſhould be killed or anywiſe diſabled. They were thus denominated, *quia accenſebantur*, or *ad cenſum adjiciebantur*. Vegetius calls them *ſupernumerarii legionum*. Cato calls them *ferentarii*, in regard they furniſhed thoſe engaged in battle with weapons, drink, &c. Though Nonnius ſuggeſts another reaſon of that appellation, viz. becauſe they fought with ſtones, ſlings, and weapons *quæ ferruntur*, ſuch as are thrown, not carried in the hand. They were ſometimes alſo called *velites*, and *velati*, becauſe they fought clothed, but not in armour; ſometimes *adſcripticii*, and *adſcriptivi*; ſometimes *rorarii*. The *accenſi*, Livy obſerves, were placed at the rear of the army, becauſe no great matter was expected from them: they were taken out of the fifth claſs of citizens.

ACCENSI, in antiquity, denotes an inferior order of officers, appointed to attend the Roman magiſtrates, ſomewhat in the manner of uſhers, ſerjeants, or tipſtaves among us. They were thus called from *accire*, to ſend for; one part of their office being to call aſſemblies of the people, ſummon parties to appear and anſwer before the judges, &c.

ACCENSI, was alſo an appellation given to a kind of adjutants, appointed by the tribune to aſſiſt each centurion and decurion. In which ſenſe, *accenſus* is ſynonymous with *optio*. In an ancient inſcription, given by á Torre, we meet ACCENSUS EQUITUM ROMANORUM; an office no where elſe heard of. That author ſuſpects it for a corruption; and inſtead thereof reads, A CENSIBUS.

ACCENSION, the action of ſetting a body on fire: thus the accenſion of tinder is effected by ſtriking fire with flint and ſteel.

ACCENT, in reading or ſpeaking, an inflection of the voice, which gives to each ſyllable of a word its due pitch in reſpect of height or lowneſs. See READING. The word is originally Latin, *accentus*: a compound of *ad*, to; and *cano*, to ſing. *Accentus*, *quaſi adcantus*, or *juxta cantum*. In this ſenſe, accent is ſynonymous with the Greek τονος; the Latin *tenor*, or *tonor*; and the Hebrew טעם, *guſtus*, taſte.—For the doctrine of *Accents* in *Compoſition*, ſee POETRY, Part III. N° 103. 114.

ACCENT, among grammarians, is a certain mark or character placed over a ſyllable, to direct the ſtreſs of its pronunciation. We generally reckon three grammatical accents in ordinary uſe, all borrowed from the Greeks, viz. the *acute accent*, (ˊ), which ſhows when the tone of the voice is to be raiſed. The *grave accent* (ˋ), when the note or tone of the voice is to be depreſſed. The *circumflex accent* (˜ or ˆ), is compoſed of both the acute and the grave, and points out a kind

Accent.

of undulation of the voice. The Latins have made the ſame uſe of theſe three accents.

The Hebrews have a grammatical, a rhetorical, and muſical accent: though the firſt and laſt ſeem, in effect, to be the ſame; both being compriſed under the general name of *tonic accents*, becauſe they give the proper tone to ſyllables; as the rhetorical accents are ſaid to be euphonic, becauſe as they tend to make the pronunciation more ſweet and agreeable. There are four euphonic accents, and 25 tonic; of which ſome are placed above, and others below the ſyllables; the Hebrew accents ſerving not only to regulate the riſings and fallings of the voice, but alſo to diſtinguiſh the ſections, periods, and numbers of periods, in a diſcourſe; and to anſwer the ſame purpoſes with the points in other languages. Their accents are divided into *emperors*, *kings*, *dukes*, &c. each bearing a title anſwerable to the importance of the diſtinction it makes. Their emperor rules over a whole phraſe, and terminates the ſenſe completely; anſwering to our point. Their king anſwers to our colon; and their duke to our comma. The king, however, occaſionally becomes a duke, and the duke a king, as the phraſes are more or leſs ſhort. It muſt be noted, by the way, that the management and combination of theſe accents differ in Hebrew poetry from what they are in proſe. The uſe of the tonic or grammatical accents has been much controverted: ſome holding that they diſtinguiſh the ſenſe; while others maintain that they are only intended to regulate the muſic, or ſinging; alleging that the Jews ſing, rather than read, the ſcriptures in their ſynagogues *. Be this, however, as it will, it is certain the ancient Hebrews were not acquainted with theſe accents. The opinion which prevails amongſt the learned, is, that they were invented about the ſixth century, by the Jewiſh doctors of the ſchool of Tiberias, called the *Maſſoretes*.

* Cooper, Dom. Moſaic. Clav. p. 31.

As to the Greek accents, now ſeen both in manuſcripts and printed books, there has been no leſs diſpute about their antiquity and uſe than about thoſe of the Hebrews. Iſaac Voſſius endeavours to prove them of modern invention; aſſerting, that anciently they had nothing of this kind, but only a few notes in their poetry, which were invented by Ariſtophanes the grammarian, about the time of Ptolemy Philopater; and that theſe were of muſical, rather than grammatical uſe, ſerving as aids in the ſinging of their poems, and very different from thoſe introduced afterwards. He alſo ſhows from ſeveral ancient grammarians, that the manner of writing the Greek accents in theſe days was quite different from that which appears in our books. The author of *La Methode Greque*, p. 546, obſerves, that the right pronunciation of the Greek language being natural to the Greeks, it was needleſs for them to mark it by accents in their writings: ſo that, according to all appearance, they only began to make uſe of them ſo low as the time in which the Romans, being curious to learn the Greek tongue, ſent their children to ſtudy at Athens, thinking thereby to fix the pronunciation, and to facilitate it to ſtrangers; which happened, as the ſame author obſerves, a little before Cicero's time. Wetſtein, Greek profeſſor at Baſil, in a learned diſſertation endeavours to prove the Greek accents of an older ſtanding. He owns that they were not always formed in the ſame manner by the ancients; but thinks that difference owing to the different pronunciation which obtained in the different parts of Greece. He brings ſeveral reaſons, *à priori*, for the uſe of accents, even in the earlieſt days: as that they then wrote all in capital letters equidiſtant from each other, without any diſtinction either of words or phraſes, which without accents could ſcarce be intelligible; and that accents were neceſſary to diſtinguiſh ambiguous words, and to point out their proper meaning; which he confirms from a diſpute on a paſſage in Homer, mentioned by Ariſtotle in his *Poëtics*, chap. v. Accordingly, he obſerves, that the Syrians, who have tonic, but no diſtinctive accents, have yet invented certain points, placed either below or above the words, to ſhow their mood, tenſe, perſon, or ſenſe.

Accent ‖ Acceptation.

The uſe of accents, to prevent ambiguities, is moſt remarkably perceived in ſome eaſtern languages, particularly the Siameſe and Chineſe. Among the people of China, every word, or (which is the ſame thing) ſyllable, admits of five accents, as ſpoken more acutely or remiſsly; and thus ſtands for many different things. The ſame ſound *ya*, according to the accent affixed to it, ſignifies *God*, a *wall*, *excellent*, *ſtupidity*, and a *gooſe*. The Chineſe have but 330 ſpoken words in their language; but theſe being multiplied by the different accents or tones, which affect the vowels, furniſh a language tolerably copious. By means hereof, their 330 ſimple ſounds come to denote 1650 things; but this being hardly ſufficient, they are increaſed further by aſpirates added to each word to double the number. The Chineſe only reckon four *accents*: for which the miſſionaries uſe the following marks, *aá*, *â*, *à*, *ǎ*; to which they have added a fifth, thus, *ā*. They make a kind of modulation; wherein, prolonging the duration of the ſound of the vowel, they vary the tone, raiſing and ſinking it by a certain pitch of voice: ſo that their talking is a ſort of muſic or ſinging. Attempts have been made to determine the quantity of the riſe or fall in each accent by means of muſical notes; but this is hard to effect, as being different in different perſons. Hence the great difficulty of the language to foreigners; they are forced to ſing moſt ſcrupulouſly: if they deviate ever ſo little from the accent, they ſay quite a different thing from what was intended. Thus, meaning to compliment the perſon you are talking to with the title *Sir*, you call him a beaſt with the ſame word, only a little varied in the tone. Magalhon makes the language the eaſier to learn on this account.—The Siameſe are alſo obſerved to ſing rather than talk. Their alphabet begins with ſix characters, all only equivalent to a K, but differently accented. For tho' in the pronunciation the accents are naturally on the vowels, yet they have ſome to diverſify ſuch of their conſonants as are in other reſpects the ſame.

Accent, in muſic, is a certain enforcement of particular ſounds, whether by the voice or inſtruments, generally uſed at the beginning of bars.

ACCEPTANCE, in law, a perſon's agreeing to offers made in bargaining, by which the bargain is concluded.

Acceptance, in the church of Rome, is put for receiving the pope's conſtitutions.

Acceptance, in commerce, is the ſubſcribing, ſigning, and making one's ſelf debtor for the ſum contained in a bill of exchange or other obligation.

ACCEPTATION, in grammar, the ſenſe or meaning wherein any word is taken.

ACCEPTER, or ACCEPTOR, the perfon who accepts a BILL of exchange, &c.

ACCEPTILATION, among civilians, an acquittance or difcharge given by the creditor to the debtor without the payment of any value.

ACCESSIBLE, fomething that may be approached, or that accefs may be had to. Thus we fay, Such a place is acceffible on one fide, &c.

ACCESSION, in law, is a method of acquiring property, by which, in things that have a clofe connection or dependence upon one another, the property of the principal thing draws after it the property of the acceffory: Thus, the owner of a cow becomes likewife the owner of the calf. It fometimes likewife fignifies confent or acquiefcence.

ACCESSION, among phyficians, is ufed for a paroxyfm of a difeafe; among politicians, it fignifies a prince's fucceeding to the government upon the death of his predeceffor.

ACCESSORY, or ACCESSARY, fomething that accedes, or is added to another more confiderable thing; in which fenfe the word ftands oppofed to PRINCIPAL.

ACCESSORY, or *Acceffary*, in common law, is chiefly ufed for a perfon guilty of a felonious offence, not principally, but by participation: as, by advice, command, or concealment.

There are two kinds of *acceffories: before* the fact, and *after* it.—The *firft* is he who commands, or procures another to commit felony, and is not prefent himfelf; for if he be prefent, he is a principal. The *fecond* is he who receives, affifts, or comforts any man that has done murder, or felony, whereof he has knowledge. A man may alfo be acceffory to an acceffory, by aiding, receiving, &c. an acceffory in felony.

An acceffory in felony fhall have judgment of life and member, as well as the principal who did the felony; but not till the principal be firft attainted, and convict, or outlawed thereon. Where the principal is pardoned without attainder, the acceffory cannot be arraigned; it being a maxim in law, *Ubi non eft principalis, non poteft effe acceffòrius*: but if the principal be pardoned, or have his clergy after attainder, the acceffory fhall be arraigned; 4 and 5 W. et M. cap. 4. And by ftat. 1 Anne, cap. 9. it is enacted, that where the principal is convicted of felony, or ftands mute, or challenges above 20 of the jury, it fhall be lawful to proceed againft the acceffory in the fame manner as if the principal had been attainted; and notwithftanding fuch principal fhall be admitted to his clergy, pardoned, or delivered before attainder. In fome cafes alfo, if the principal cannot be taken, then the acceffory may be profecuted for a mifdemeanour, and punifhed by fine, imprifonment, &c. In the loweft and higheft offences there are no acceffories, but all are principals: as in riots, routs, forcible entries, and other trefpaffes, which are the loweft offences. So alfo in the higheft offence, which is, according to the Englifh law, high treafon, there are no acceffories.

Acceffories, in petty treafon, murder, and in felonies of feveral kinds, are not to have their clergy. There can be no acceffory before the fact in manflaughter; becaufe that is fudden and unprepenfed.

ACCESSORY Nerves, in anatomy, a pair of nerves, which, arifing from the medulla in the vertebræ of the neck, afcend, and enter the fkull, and pafs out of it again with the par vagum, wrapped up in the fame common integument, and after quitting them, are diftributed into the mufcles of the neck and fhoulders. See ANATOMY.

ACCESSORY, among painters, an epithet given to fuch parts of an hiftory-piece as ferve chiefly for ornament, and might have been wholly left out: fuch as vafes, armour, &c.

ACCI, (*anc. geog.*) a town of Tarraconenfis, formerly called *Acti*; fuppofed to be *Guadix*, to the eaft of the city of Granada, at the foot of a mountain, near the fource of the rivulet Guadalantin; now greatly decayed. It is the Colonia Accitana Gemella, and was of fome repute among the Roman colonies. The people were called Gemellenfes, becaufe the colony confifted of colonifts from the third and fixth legions.

ACCIAIOLI (Donata), a man famous for his learning and the honourable employments he poffeffed in Florence his native country, in the 15th century. He wrote, A Latin tranflation of fome of Plutarch's Lives; Commentaries on Ariftotle's Ethics and Politics; and the Life of Charlemagne. He was fent to France by the Florentines, to fue for fuccour from Lewis XI. againft Pope Sextus IV. but on his journey died at Milan; his body was carried to Florence, and buried in the church of the Carthufians. The fmall fortune he left his children is a proof of his probity and difintereftednefs. His daughters, like thofe of Ariftides, were married at the public expence, as an acknowledgment of his fervices. His funeral eulogium was fpoken by Chriftopher Landini; and an elegant epitaph, by Politian, was infcribed on his tomb.

ACCIDENT, in a general fenfe, denotes any cafual event.

ACCIDENT, among logicians, is ufed in a threefold fenfe. 1. Whatever does not effentially belong to a thing; as the clothes a man wears, or the money in his pocket. 2. Such properties in any fubject as are not effential to it; thus whitenefs in paper is an accidental quality. 3. In oppofition to fubftance, all qualities whatever are called accidents; as fweetnefs, foftnefs, &c.

ACCIDENT, in grammar, implies a property attached to a word, without entering into its effential definition; for every word, notwithftanding its fignification, will be either primitive, derivative, fimple, or compound, which are the accidents of words. A word is faid to be primitive, when it is taken from no other word in the language in which it is ufed: thus *heaven*, *king*, *good*, are primitive words. It is faid to be derivative, when it is taken from fome other word: thus *heavenly*, *kingdom*, *goodnefs*, &c. are derivatives. A fimple word is eafily diftinguifhed from a compound: thus *juft*, *juftice*, are fimple words; *unjuft*, *injuftice*, are compound: *res* is a fimple word, as well as *publica*; but *refpublica* is a compound. Befides thefe accidents, which are common to all forts of words, each particular fpecies has its accidents: thus the accidents of the noun fubftantive are the gender, declenfion, and number; and the adjective has another accident, namely, the comparifon. See the article GRAMMAR and LANGUAGE.

ACCIDENT, in heraldry, an additional point or mark in a coat of arms, which may be either omitted or retained without altering the effence of the armour; fuch as, abatement, difference, and tincture.

ACCIDENTAL, in a general ſenſe, implies ſomething that happens by accident, or that is not eſſential to its ſubject.

Accidental, in philoſophy, is applied to that effect which flows from ſome cauſe intervening by accident, without being ſubject, or at leaſt without any appearance of being ſubject, to general laws or regular returns. In this ſenſe, *accident* is oppoſed to *conſtant* and *principal*. Thus the ſun's place is, with reſpect to the earth, the conſtant and principal cauſe of the heat in ſummer, and the cold in winter; whereas winds, ſnows, and rains, are the accidental cauſes which often alter and modify the action of the principal cauſe.

Accidental Point, in perſpective, is that point in the horizontal line where the projections of two lines parallel to each other meet the perſpective plane.

Accidental Colours, are thoſe which depend upon the affections of the eye, in contradiſtinction to thoſe which belong to the light itſelf. The impreſſions made upon the eye by looking ſtedfaſtly at a particular colour are various, according to the ſingle colour or combination of colours in the object; and they continue for ſome time after the eye is withdrawn, and give a falſe colouring to other objects. Mr Buffon has endeavoured to trace the connections which theſe accidental colours have with ſuch as are natural, in a variety of inſtances. The ſubject has alſo been conſidered by De la Hire, and M. Epences; and M. d'Arcy has contrived a machine for determining the duration of the effects of light, and after ſeveral trials, finds that it continues about eight thirds of a minute.

ACCIPENSER, in ichthyology, a genus of fiſhes belonging to the Amphibia Nantes of Linnæus. The accipenſer has a ſingle linear noſtril: the mouth is in the under part of the head, and contains no teeth; the cirri are below the ſnout, and before the mouth. There are three ſpecies of this genus, *viz.*

1. The ruthenus has 4 cirri, and 15 ſquamous protuberances. It is a native of Ruſſia.

2. The huſo has 4 cirri; the body is naked, *i. e.* has no prickles or protuberances. The ſkin of the huſo is ſo tough and ſtrong, that it is employed for ropes in carts and other wheel-carriages; and the ichthyocollo, or isinglass of the ſhops, famous as an agglutinant, and uſed alſo for the fining of wines, is made from its ſound or ſcales. The ancients were acquainted with the fiſh that afforded this drug. The huſo is the largeſt of the genus, and grows to 24 feet in length. It inhabits the Danube and the rivers of Ruſſia.

3. The ſturio, or ſturgeon, with 4 cirri and 11 ſquamous protuberances on the back. This fiſh annually aſcends our rivers, but in no great numbers, and is taken by accident in the ſalmon-nets. It ſeems a ſpiritleſs fiſh, making no manner of reſiſtance when entangled, but is drawn out of the water like a lifeleſs lump. It is ſeldom taken far out at ſea, but frequents ſuch parts as are not remote from the æſtuaries of great rivers. It is admired for the delicacy and firmneſs of its fleſh, which is white as veal, and extremely good when roaſted. It is generally pickled. The moſt we receive comes either from the Baltic rivers or North America. Great numbers are taken during ſummer in the lakes Friſchehaff, and Curiſch-haff near Pillau, in large nets made of ſmall cord. The adjacent ſhores are formed into diſtricts, and farmed out to companies of fiſhermen, ſome of which are rented for ſix thouſand guilders, or near three hundred pounds, *per annum.* They are found in vaſt abundance in the American rivers in May, June, and July; at which time they leap ſome yards out of the water, and, falling on their ſides, make a noiſe to be heard in ſtill weather at ſome miles diſtance. Caviare is made of the roes of this, and alſo of all the other ſorts of ſturgeons, dried, ſalted, and packed up cloſe. Ichthyocolla, or iſinglaſs, is likewiſe made of the ſound of this fiſh, as well as that of the others; but in very ſmall quantity. The ſturgeon grows to a great ſize, to the length of 18 feet, and to the weight of 500 pounds, but it is ſeldom taken in our rivers of that bulk. In the manner of breeding, this fiſh is an exception among the cartilaginous kind; being, like the bony fiſh, oviparous, ſpawning in water.

ACCIPITER, the name of Linnæus's firſt order of Birds. See Zoology.

Among the Romans, the term *accipiter* ſignified a hawk, and which, from its being very carnivorous, they conſidered as a bird of bad omen;

Odimus accipitrem, quia ſemper vivit in armis. Ovid.

Pliny, however, tells us, that in ſome caſes, particularly in marriage, it was eſteemed a bird of good omen, becauſe it never eats the hearts of other birds; intimating thereby, that no differences in a married ſtate ought to reach the heart. The accipiter was worſhipped as a divinity by the inhabitants of Tentyra, an iſland in the Nile, being conſidered by them as the image of the ſun; and hence we find that luminary repreſented, in hieroglyphics, under the figure of a hawk.

ACCISMUS, denotes a feigned refuſal of ſomething which a perſon earneſtly deſires. The word is Latin; or rather Greek, Ακκισμος; ſuppoſed to be formed from *Acco*, the name of a fooliſh old woman noted in antiquity for an affectation of this kind.

Acciſmus is ſometimes conſidered as a virtue; ſometimes as a vice, which Auguſtus and Tiberius practiſed with great ſucceſs. Cromwell's refuſal of the crown of England may be brought as an inſtance of an Acciſmus.

Accismus is more particularly uſed, in rhetoric, as a ſpecies of irony.

ACCITUM, (anc. geog.), a town of Hiſpania Batica, now *Finiana*, as appears from an ancient inſcription; ſituate on an eminence of the mountains Alpuxaras in Granada.

ACCIUS (Lucius), a Latin tragic poet, the ſon of a freedman, and, according to St Jerom, born in the conſulſhip of Hoſtilius Mancinus and Attilius Serranus, in the year of Rome 583; but there appears ſomewhat of confuſion and perplexity in this chronology. He made himſelf known before the death of Pacuvius, a dramatic piece of his being exhibited the ſame year that Pacuvius brought one upon the ſtage, the latter being then eighty years of age, and Accius only thirty. We do not know the name of this piece of Accius's, but the titles of ſeveral of his tragedies are mentioned by various authors. He wrote on the moſt celebrated ſtories which had been repreſented on the Athenian ſtage; as Andromache, Andromeda, Atreus, Clytemneſtra, Medea, Meleager, Philocletes,

Accius, Acclamation.

the civil wars of Thebes, Tereus, the Troades, &c. He did not always, however, take his fubjects from the Grecian ftory; for he compofed one dramatic piece wholly Roman: it was intitled *Brutus*, and related to the expulfion of the Tarquins. It is affirmed by fome, that he wrote alfo comedies; which is not unlikely, if he was the author of two pieces, the Wedding and the Merchant, which have been afcribed to him. He did not confine himfelf to dramatic writing; for he left other productions, particularly his annals, mentioned by Macrobius, Prifcian, Feftus, and Nonius Marcellus. He has been cenfured for writing in too harfh a ftyle, but in all other refpects has been efteemed a very great poet. He was fo much efteemed by the public, that a comedian was punifhed for only mentioning his name on the ftage. Cicero fpeaks with great derifion of one Accius who had written a hiftory; and, as our author had wrote annals, fome infift that he is the perfon cenfured: but as Cicero himfelf, Horace, Quintilian, Ovid, and Paterculus, have fpoken of our author with fo much applaufe, we cannot think it is him whom the Roman orator cenfures with fo much feverity.

There was alfo in this age a pretty good orator of the fame name, againft whom Cicero defended Cluentius. He was born in Pifaurum, and perhaps was a relation of our poet.

ACCIUS, a poet of the 16th century, to whom is attributed *A Paraphrafe of Æfop's Fables*, on which Julius Scaliger beftows great encomiums.

ACCLAMATION, a confufed noife or fhout of joy, by which the public exprefs their applaufe, efteem, or approbation.

Acclamation, in a more proper fenfe, denotes a certain form of words, uttered with extraordinary vehemence, and in a peculiar tone fomewhat refembling a fong, frequent in the ancient affemblies. Acclamations were ufually accompanied with applaufes, with which they are fometimes confounded: though they ought to be diftinguifhed; as acclamation was given by the voice, applaufe by the hands; add, that acclamation was alfo beftowed on perfons abfent, applaufe only on thofe prefent. Acclamation was alfo given by women, whereas applaufe feems to have been confined to men.

Acclamations are of various kinds; ecclefiaftical, military, nuptial, fenatorial, fynodical, fcholaftic, theatrical, &c. We meet with loud acclamations, mufical, and rythmical acclamations; acclamations of joy and refpect, and even of reproach and contumely. The former, wherein words of happy omen were ufed, were alfo called, *Laudationes, et bona vota*, or good wifhes; the latter, *Execrationes et convicia*. Suetonius furnifhes an inftance of this laft kind in the Roman fenate, on occafion of the decree for demolifhing the ftatues of Domitian, when the fathers, as the hiftorian reprefents it, could not refrain from contumelious acclamations of the deceafed. The like were fhown after the death of Commodus, where the acclamations run in the following ftrain: *Hofti patriæ honores detrahantur, parricidæ honores detrahantur; hoftis ftatuas undique, parricidæ ftatuas undique, gladiatoris ftatuas undique*, &c.—The formula, in acclamations, was repeated fometimes a greater, fometimes a leffer, number of times. Hence we find in Roman writers, *acclamatum eft quinquies, et vicies;* five times, and twenty times: fometimes alfo *fexagies*, and even *octuagies;* fixty and eight times.

Acclamations were not unknown on the theatres in the earlieft ages of the Roman commonwealth; but they were artlefs then, and little other than confufed fhouts. Afterwards they became a fort of regular concerts. That mentioned by Phædrus, *lætare incolumis Roma falvo principe*, which was made for Auguftus, and proved the occafion of a pleafant miftake of a flute-player called *Princeps*, fhows that mufical acclamations were in ufe in that emperor's reign. *Revertentem ex Provincia modulatis carminibus profequebantur*, fays Suetonius, who gives another inftance in the time of Tiberius: a falfe report of Germanicus's recovery being fpread through Rome, the people ran in crowds to the capitol with torches and victims, finging, *Salva Roma, Salva Patria, Salvus eft Germanicus*.—Nero, paffionately fond of mufic, took fpecial care to improve and perfect the mufic of acclamations. Charmed with the harmony wherewith the Alexandrians, who came to the games celebrated at Naples, had fung his praifes, he brought feveral over to inftruct a number of youth, chofen from among the knights and people, in the different kinds of acclamations practifed at Alexandria. Thefe continued in ufe as long as the reign of Theodoric. But the people did not always make a fingle chorus; fometimes there were two, who anfwered each other alternately: thus, when Nero played on the theatre, Burrhus and Seneca, who were on either hand, giving the fignal by clapping, 5000 foldiers called Auguftals, began to chant his praife, which the fpectators were obliged to repeat. The whole was conducted by a mufic-mafter called *Mefochorus* or *Paufarius*.—The honour of acclamations was chiefly rendered to emperors, their children, and favourites; and to the magiftrates who prefided at the games. Perfons of diftinguifhed merit alfo fometimes received them, of which Quintilian gives us inftances in Cato and Virgil. The moft ufual forms were, *Feliciter, Longiorem vitam, Annos felices*. The actors themfelves, and they who gained the prizes in the games of the circus, were not excluded the honour of acclamations.

To theatrical acclamations may be added thofe of the foldiery and the people in time of triumph. The victorious army accompanied their general to the capitol; and, among the verfes they fung in his praifes, frequently repeated, Io Triumphe, which the people anfwered in the fame ftrain. It was alfo in the way of acclamation, that the foldiers gave their general the title of *Imperator*, after fome notable victory: a title which he only kept till the time of his triumph.

The acclamations of the fenate were fomewhat more ferious than the popular ones; but arofe from the fame principle, *viz.* a defire of pleafing the prince or his favourites; and aimed likewife at the fame end, either to exprefs the general approbation and zeal of the company, or to congratulate him on his victories, or to make him new proteftations of fidelity. Thefe acclamations were ufually given after a report made by fome fenator, to which the reft all expreffed their confent by crying Omnes, Omnes; or elfe, Æquum est, Justum est. Sometimes they began with acclamations, and fometimes ended with them without other debates. It was after this manner that all the elections and proclamations of emperors, made by the fenate, were conducted; fomething of which practice is ftill retained at modern elections of kings and emperors, where *Vivat Rex*,

Rex, *Vive le Roy*, and *Long live the King*, are cuſtomary forms.

The Greeks borrowed the cuſtom of receiving their emperors in the public places from the Romans. Luitprand relates, that at a proceſſion where he was preſent, they ſung to the emperor Nicephorus, πολλα ετη; that is, Many years: which Codin expreſſes thus, by το ψαλλειν το πολυχρονιον, or by το πολυχρονιζειν; and the wiſh or ſalutation by πολυχρονισμα. And at dinner, the Greeks then preſent wiſhed with a loud voice to the emperor and Bardas, *Ut Deus annos multiplicet;* as he tranſlates the Greek. Plutarch mentions an acclamation ſo loud, upon occaſion of Flaminius's reſtoring liberty to Greece, that the very birds fell from heaven with the ſhout. The Turks practiſe ſomething like this on the ſight of their emperors and grand viziers to this day.

For the acclamations wherewith authors, poets, &c. were received, who recited their works in public; it is to be obſerved, the aſſemblies for this purpoſe were held with great parade in the moſt ſolemn places, as the capitol, temples, the Athenæum, and the houſes of great men. Invitations were ſent every where, in order to get the greater appearance. The chief care was, that the acclamations might be given with all the order and pomp poſſible. Men of fortune who pretended to wit, kept able applauders in their ſervice, and lent them to their friends. Others endeavoured to gain them by preſents and treats. Philoſtratus mentions a young man named Vavus, who lent money to the men of letters, and forgave the intereſt to ſuch as applauded his exerciſes. Theſe acclamations were conducted much after the ſame manner as thoſe on the theatre, both as to the muſic and the accompaniments: they were to be ſuited both to the ſubject and to the perſon. There were particular ones for the philoſophers, for orators, for hiſtorians, and for poets. It would be difficult to rehearſe all the forms of them; one of the moſt uſual was *Sophos*, which was to be repeated three times. Martial comprehends ſeveral other uſual forms in this verſe:

Graviter, Cito, Nequiter, Euge, Beate.

Neither the Greeks nor Romans were barren on this head. The names of gods and heroes were given thoſe whom they would extol. It was not enough to do it after each head of diſcourſe, chiefly after the exordium; but the acclamations were renewed at every fine paſſage, frequently at every period.

The acclamations wherewith the ſpectators honoured the victories of the athletæ, were a natural conſequence of the impetuous motions which attended the gymnaſtic games. The cries and acclamations of the people, ſometimes expreſſing their compaſſion and joy, ſometimes their horror and diſguſt, are ſtrongly painted by different poets and orators.

Acclamations made alſo a part of the ceremony of marriage. They were uſed for the omen's ſake; being the *Læta Omina*, ſometimes ſpoken of before marriage in Roman writers.

Acclamations, at firſt practiſed in the theatre, and paſſing thence to the ſenate, &c. was in proceſs of time received into the acts of councils, and the ordinary aſſemblies of the church. The people expreſſed their approbation of the preacher variouſly; the more uſual forms were, *Orthodox! Third Apoſtle*, &c. Theſe acclamations being ſometimes carried to exceſs, and often miſplaced, were frequently prohibited by the ancient doctors, and at length abrogated; though they appear to have been in ſome uſe as low as the time of St Bernard.

Acclamation Medals, among antiquaries, ſuch as repreſent the people expreſſing their joy in the poſture of acclamation.

ACCLIVITY, the riſe or aſcent of a hill, in oppoſition to the declivity or deſcent of it. Some writers in fortification uſe it for the talus of a rampart.

ACCOLA, among the Romans, ſignified a perſon who lived *near* ſome place; in which ſenſe, it differed from *incola*, the *inhabitant* of ſuch a place.

ACCOLADE, a ceremony anciently uſed in the conferring of knighthood.

Antiquaries are not agreed wherein the accolade properly conſiſted. The generality ſuppoſe it to be the embrace, or kiſs, which princes anciently gave the new knight, as a token of their affection: whence the word *accolade; q. d.* a claſping, or taking round the neck. Others will rather have it to be a blow on the chine of the neck, given on the ſame occaſion. The Accolade is of ſome antiquity, in which ſoever of the two ſenſes it be taken. Greg. de Tours writes, that the kings of France, even of the firſt race, in conferring the gilt ſhoulder-belt, kiſſed the knights on the left cheek. For the *accolée*, or blow, John of Saliſbury aſſures us, it was in uſe among the ancient Normans: by this it was that William the Conqueror conferred the honour of knighthood on his ſon Henry. At firſt, it was given with the naked fiſt; but was afterwards changed into a blow with the flat of the ſword on the ſhoulder of the knight.

ACCOLEE, ſometimes ſynonymous with Accolade, which ſee.—It is alſo uſed in various ſenſes in heraldry: ſometimes it is applied to two things joined; at other times, to animals with crowns, or collars about their necks, as the lion in the Ogilvy's arms; and, laſtly, to kews, battons, maces, ſwords, &c. placed ſaltierwiſe behind the ſhield.

ACCOLTI (Bernardo), ſecretary to the republic of Florence, was ſurnamed L'Unico, or the Nonſuch, probably from the great extent of his underſtanding, the variety of ſciences he had acquired, and the excellency of his poetic vein; which not only gained him a ſeat among the academicians of the court of Urbino, but made that great Mecænas, pope Leo X. in 1520, create him prince of the ſtate of Nepi. He wrote many pieces; among others, a collection of beautiful poems, printed at Venice in 1519 and 1553.

ACCOMMODATION, the application of one thing, by analogy, to another; or the making two or more things agree with one another.

To know a thing by *accommodation*, is to know it by the idea of a ſimilar thing referred thereto.

A prophecy of ſcripture is ſaid to be fulfilled various ways; properly, as when a thing foretold comes to paſs; and improperly, or by way of *accommodation*, when an event happens to any place or people, like to what fell out ſome time before to another.—Thus, the words of Iſaiah, ſpoken to thoſe of his own time, are ſaid to be fulfilled in thoſe who lived in our Saviour's; and are *accommodated* to them: "Ye hypocrites, well did Iſaias prophecy of you," &c. which ſame words St Paul afterwards *accommodates* to the Jews of his time.

The primitive church *accommodated* multitudes of Jewish, and even heathen ceremonies and practices, to Christian purposes; but the Jews had before done the same by the Gentiles: some will even have circumcision, the tabernacle, brazen serpent, &c. to have been originally of Egyptian use, and only *accommodated* by Moses to the purposes of Judaism*. Spencer maintains, that most of the rites of the old law were an imitation of those of the Gentiles, and particularly of the Egyptians; that God, in order to divert the children of Israel from the worship they paid to the false deities, consecrated the greatest part of the ceremonies performed by those idolaters, and had formed out of them a body of the ceromonial law; that he had indeed made some alterations therein, as barriers against idolatry; and that he thus *accommodated* his worship to the genius and occasions of his ancient people. To this condescension of God, according to Spencer†, is owing the origin of the tabernacle, and particularly that of the ark. These opinions, however, have been controverted by later writers.

* Saurin. Diss. O. T. tom. i.

† De legib. Hebr. diss. i. l. 3. p. 32.

ACCOMPANIMENT, something attending or added as a circumstance to another, either by way of ornament, or for the sake of symmetry.

Accompaniment, in music, denotes the instruments which accompany a voice, in order to sustain it, as well as to make the music more full. The accompaniment is used in recitative, as well as in song; on the stage, as well as in the choir, &c. The ancients had likewise their accompaniments on the theatre; they had even different kinds of instruments to accompany the chorus, from those which accompanied the actors in the recitation.—The accompaniment, among the moderns, is frequently a different part or melody from the song it accompanies. It is disputed whether it was so among the ancients. It is generally alleged, that their accompaniments went no farther than the playing in octave, or in antiphony to the voice. The Abbé Fraguier, from a passage in Plato, pretends to prove, that they had actual symphony, or music in parts: but his arguments seem far from being conclusive.

Accompaniment, in painting, denotes such objects as are added, either by way of ornament, or probability; as dogs, guns, game, &c. in a hunting-piece.

Accompaniment, in heraldry, any thing added to a shield by way of ornament; as the belt, mantling, supporters, &c. It is also applied to several bearings about a principal one; as a saltier, bend, fess, chevron, &c.

ACCOMPLICE, one that has a hand in a business; or is privy in the same design or crime with another. See Accessory.

By the law of Scotland, the *accomplice* can only be prosecuted after the conviction of the *principal* offender, unless the accession of the *accomplice* is immediate, in *ipso actu*, so as in effect to render them *co-principal.* By the general rule, the *accomplice* suffers the same punishment with the *principal* offender; yet if he be remarkably less guilty, justice will not permit equal punishment.

The council of Sens, and several other synodical statutes, expressly prohibit the revealing of *accomplices*.

ACCOMPLISHMENT, the entire execution or fulfilling of any thing.

Accomplishment, is principally used in speaking of events foretold by the Jewish prophets in the Old Testament, and fulfilled under the New. We say a literal accomplishment, a mystical or spiritual accomplishment, a single accomplishment, a double accomplishment, a Jewish accomplishment, a Christian, a heathen accomplishment. The same prophecy is sometimes accomplished in all, or in several of those different ways. Thus, of some of the prophecies of the Old Testament, the Jews find a literal accomplishment in their own history, about the time when the prophecy was given: the Christians find another in Christ, or the earliest days of the church; the heathens another, in some of their emperors; the Mahometans another, in their legislator, &c. There are two principal ways of accomplishing a prophecy; *directly*, and by *accommodation*. See Accommodation, and Prophecy.

Accomplishment, is also used for any mental or personal endowment.

Accord, in painting, is the harmony that reigns among the lights and shades of a picture.

Accords (Stephen Tabourot, seigneur des), advocate in the parliament of Dijon in France, and king's advocate in the bailiwic and chancery of that city, born in the year 1549. He was a man of genius and learning; but too much addicted to trifles, as appears from his piece, intitled, "Les Bigarrures," printed at Paris in 1582. This was not his first production, for he had before printed some sonnets. His work, intitled, "Les Touches," was published at Paris in 1585; which is indeed a collection of witty poems, but worked up rather in too loose a manner, according to the licentious taste of that age. His Bigarrures are written in the same strain. He was censured for this way of writing, which obliged him to publish an apology. The lordship of Accords is an imaginary fief or title from the device of his ancestors, which was a drum, with the motto, *à tous accords*, "chiming with all." He had sent a sonnet to a daughter of Mr Begat, the great and learned president of Burgundy, "who (says he) did me the honour to love me:—And inasmuch (continues he), I had subscribed my sonnet with only my device, *à tous accords*, this lady first nicknamed me, in her answer, *Seigneur des Accords;* by which title her father also called me several times. For this reason I chose this surname, not only in all my writings composed at that time, but even in these books." He died July 24th 1561, in the 46th year of his age.

ACCOUNT, or Accompt, in a general sense, a computation or reckoning of any thing by numbers.—Collectively, it is used to express the books which merchants, traders, bankers, &c. use for recording their transactions in business. See Book-keeping.

Chamber of Accounts, in the French polity, is a sovereign court of great antiquity, which takes cognisance of and registers the accounts of the king's revenue. It is nearly the same with the English *Court of Exchequer.*

Account is taken sometimes, in a particular sense, for the computation of time: thus we say, The Julian Account, the Gregorian Account, &c. in which sense it is equivalent to *style.*

ACCOUNTANT, or Accomptant, in the most general sense, is a person skilled in accounts. In a more restricted sense, it is applied to a person, or officer, appointed to keep the accounts of a public company or office; as the South-sea, the India-company, the Bank, the Excise, &c.

ACCOUNTANTSHIP, the art of keeping and balancing accounts. See Book-keeping.

ACCOUNTANT-general, a new officer in the court of Chancery appointed by act of parliament to receive all moneys lodged in court inftead of the mafters, and convey the fame to the bank of England for fecurity.

ACCOUTREMENT, an old term, applied to the furniture of a foldier, knight, or gentleman.

ACCRETION, in phyfics, the increafe, or growth of an organical body, by the acceffion of new parts. See Nutrition, Plants, and Vegetables.

Accretion, among civilians, the property acquired in a vague or unoccupied thing, by its adhering to or following another already occupied: thus, if a legacy be left to two perfons, one of whom dies before the teftator, the legacy devolves to the furvivor by right of accretion.

ACCROCHE, in heraldry, denotes a thing's being hooked with another.

ACCUBATION, a pofture of the body, between fitting and lying. The word comes from the Latin *accubare*, compounded of *ad*, to, and *cubo*, I lie down. *Accubation*, or *Accubitus*, was the table-pofture of the Greeks and Romans; whence we find the words particularly ufed for the lying, or rather (as we call it) fitting, down to meat. The Greeks introduced this pofture. The Romans, during the frugal ages of the republic, were ftrangers to it: but as luxury got footing, this pofture came to be adopted, at leaft by the men; for as to women, it was reputed an indecency in them to lie down among the men: though, afterwards, this too was got over. But children did not lie down, nor fervants, nor foldiers, nor perfons of meaner condition; but took their meals fitting, as a pofture lefs indulgent. The Roman manner of difpofing themfelves at table was this: A low round table was placed in the cœnaculum, or dining-room; and, about this, ufually three, fometimes only two, beds or couches; according to the number of which, it was called *biclinium* or *triclinium*. Thefe were covered with a fort of bed-clothes, richer or plainer according to the quality of the perfon, and furnifhed with quilts and pillows, that the guefts might lie the more commodioufly. There were ufually three perfons on each bed; to crowd more, was efteemed fordid. In eating, they lay down on their left fides, with their heads refting on the pillows, or rather on their elbows. The firft lay at the head of the bed, with his feet extended behind the back of the fecond; the fecond lay with the back of his head towards the navel of the firft, only feparated by a pillow, his feet behind the back of the third; and fo of the third, or fourth. The middle place was efteemed the moft honourable. Before they came to table, they changed their clothes, putting on what they called *cœnatoria veftis*, the dining-garment; and pulled off their fhoes, to prevent fouling the couch.

ACCUBITOR, an ancient officer of the emperors of Conftantinople, whofe bufinefs was to lie near the emperor. He was the head of the youth of the bed-chamber, and had the *cubicularius* and *procubitor* under him.

ACCUMULATION, in a general fenfe, the act of heaping or amaffing things together. Among lawyers, it is ufed in fpeaking of the concurrence of feveral titles to the fame thing, or of feveral circumftances to the fame proof.

Accumulation of Degrees, in an univerfity, is the taking feveral of them together, or at fmaller intervals than ufual or than is allowed by the rules of the univerfity.

ACCURSED, fomething that lies under a curfe, or fentence of excommunication.

In the Jewifh idiom, *accurfed* and *crucified* were fynonymous. Among them, every one was accounted *accurfed* who died on a tree. This ferves to explain the difficult paffage in Rom. ix. 3. where the apoftle Paul wifhes himfelf *accurfed after the manner of Chrift, i. e.* crucified, if happily he might by fuch a death fave his countrymen. The prepofition ἀπὸ here made ufe of, is ufed in the fame fenfe, 2. Tim. i. 3. where it obvioufly fignifies *after the manner of.*

ACCURSIUS, a law-profeffor in the 13th century, born in Florence. His authority was for fome time fo great, that he was called the Idol of the Lawyers. —Other three lawyers of note had the fame name.

Accursius (Mariangelus), a famous critic of the 16th century, born at Aquilo in the kingdom of Naples. His Diatrebes, printed at Rome in folio, in 1524, on Ovid and Solinus, are a proof of his abilities in that kind of erudition, In his edition of Ammianus Marcellinus there are five books more than in any of the preceding ones; and he affirms he had corrected 5000 errors in that hiftorian. His predominant paffion was the fearching for and collecting of old manufcripts: yet he made Latin and Italian verfes; was complete mafter of the French, German, and Spanifh tongues; and underftood optics and mufic. He purged himfelf by oath, being charged for being a plagiary with regard to his Aufonius; it being reported, that he had appropriated to himfelf the labours of Fabricio Varana, bifhop of Camerino.

ACCUSATION, the charging any perfon with a criminal action, either in one's own name, or in that of the public. The word is compounded of *ad*, to; and *caufari*, to plead.

Writers on politics treat of the benefit and the inconveniences of public accufations. Various arguments are alleged, both for the encouragement and difcouragement of accufations againft great men. Nothing, according to Machiavel, tends more to the prefervation of a ftate, than frequent accufations of perfons trufted with the adminiftration of public affairs. This, accordingly, was ftrictly obferved by the Romans, in the inftances of Camillus, accufed of corruption by Manlius Capitolinus, &c. Accufations, however, in the judgment of the fame author, are not more beneficial than calumnies are pernicious; which is alfo confirmed by the practice of the Romans. Manlius not being able to make good his charge againft Camillus, was caft into prifon.

By the *Roman* law, there was no public accufer for public crimes; every private perfon, whether interefted in the crime or not, might accufe, and profecute the accufed to punifhment, or abfolution. Cato, the moft innocent perfon of his age, had been accufed 42 times, and as often abfolved. But the accufation of *private* crimes was never received but from the mouths of thofe who were immediately interefted in them: None (*e. g.*) but the hufband could accufe his wife of adultery.

The

Accusative || Acentetum.

The ancient Roman lawyers diſtinguiſhed between *poſtulatio*, *delatio*, and *accuſatio*. For, firſt, leave was deſired to bring a charge againſt one, which was called *poſtulare*: then he againſt whom the charge was laid, was brought before the judge; which was called *deferre*, or *nominis delatio*: laſtly, the charge was drawn up and preſented, which was properly the *accuſatio*. The accuſation properly commenced, according to Pædianus, when the *reus* or party charged, being interrogated, denied he was guilty of the crime, and ſubſcribed his name to the *delatio* made by his opponent.

In the *French* law, none but the Procureur general, or his deputies, can form an accuſation, except for high-treaſon and coining, where accuſation is open to every body. In other crimes, private perſons can only act the part of denouncers, and demand reparation for the offence, with damages.

In *Britain*, by Magna Charta, no man ſhall be impriſoned or condemned on any accuſation, without trial by his peers, or the law; none ſhall be vexed with any accuſation, but according to the law of the land; and no man may be moleſted by petition to the king, &c. unleſs it be by indictment or preſentment of lawful men, or by proceſs at common law. Promoters of ſuggeſtions, are to find ſurety to purſue them; and if they do not make them good, ſhall pay damages to the party accuſed, and alſo a fine to the king. No perſon is obliged to anſwer upon oath to a queſtion whereby he may accuſe himſelf of any crime.

ACCUSATIVE, in the Latin grammar, is the fourth caſe of nouns, and ſignifies the relation of the noun on which the action implied in the verb terminates; and hence, in ſuch languages as have caſes, theſe nouns have a particular termination, called *accuſative*: as, *Auguſtus vicit Antonium*, Auguſtus vanquiſhed Antony. Here *Antonium* is the noun, on which the action implied in the verb *vicit* terminates; and, therefore, muſt have the accuſative termination. Ovid, ſpeaking of the palace of the ſun, ſays, *Materiem ſuperabat opus*, The work ſurpaſſed the materials. Here *materiem* has the accuſative termination; becauſe it determines the action of the verb *ſuperabat*.—In the Engliſh language there are no caſes, except the genitive; the relation of the noun being ſhown by the aſſiſtance of prepoſitions, as *of*, *to*, *from*, &c.

ACCUSIORUM Colonia (anc. geog.), an inland town in the Cavares, in Gallia Narbonenſis: now *Grenoble*, in Dauphiné. See Grenoble.

ACE, among gameſters, a card or die marked only with one point.

ACELUM, or Acelium (anc. geog.), a town of the Venetian territory, now called *Azolo*, ſituated to the weſt of Trevigi, at the ſource of the rivulet Muſone. E. Long. 13°. N. Lat. 45°.

ACENTETUM, or Acanteta, in natural hiſtory, a name given by the ancients to the pureſt and fineſt kind of rock-cryſtal: They uſed the cryſtal in many ways; ſometimes engraving on it, and ſometimes forming it into vaſes and cups, which were held next in value to the *vaſa murrhina* of thoſe times. The cryſtal they obtained from the iſland of Cyprus was much eſteemed; but often faulty in particular parts, having hairs, cracks, and foulneſſes, which they called *ſalts*, in the middle of the large pieces. Pliny tells us, that when it was uſed for engraving on, the artiſt could conceal all theſe blemiſhes among the ſtrokes of his work; but when it was to be formed into cups or precious vaſes, they always choſe the acentetum which had no flaws or blemiſhes.

Acephali || Acephalous.

ACEPHALI, or Acephalitæ, a term applied to ſeveral ſects who refuſed to follow ſome noted leader. Thus the perſons who refuſed to follow either John of Antioch, or St Cyril, in a diſpute that happened in the council of Epheſus, were termed *Acephali*, without a head or leader. Such biſhops, alſo, as were exempt from the juriſdiction and diſcipline of their patriarch, were ſtyled *Acephali*.

Acephali, the levellers in the reign of king Henry I. who acknowledged no head or ſuperior. They were reckoned ſo poor, that they had not a tenement by which they might acknowledge a ſuperior lord.

ACEPHALOUS, or Acephalus, in a general ſenſe; without a head.

The term is more particularly uſed in ſpeaking of certain nations, or people, repreſented by ancient naturaliſts and coſmographers, as well as by ſome modern travellers, as formed without heads; their eyes, mouths, &c. being placed in other parts.

Such are the Blemmyes, a nation of Africa near the head of the Niger, repreſented to be by Pliny and Solinus; *Blemmyes traduntur capita abeſſe, ore et oculis pectore affixis*. Cteſias and Solinus mention others in India near the Ganges, *ſine cervice, oculos in humeris habentes*. Mela alſo ſpeaks of people, *quibus capita et vultus in pectore ſunt*. And Suidas, Stephanus Byzantinus, Vopiſcus, and others after them, relate the like. Some modern travellers ſtill pretend to find acephalous people in America.

Several opinions have been framed as to the origin of the fable of the Acephali. The firſt is that of Thomas Bartholin, who turns the whole into a metaphor; being convinced, that the name Acephali was anciently given to ſuch as had leſs brain, or conducted themſelves leſs by the rules of prudence, than others. Olearius rather apprehends, that the ancient voyagers, viewing certain barbarous people from the coaſts, had been impoſed on by their uncouth dreſs; for that the Samogitians, being ſhort of ſtature, and going in the ſeverity of winter with their heads covered in hoods, ſeem at a diſtance as if they were heedleſs. F. Laſitau ſays, that by Acephali are only meant, people whoſe heads are ſunk below their ſhoulders. In effect, Hulſius, in his epitome of Sir Walter Raleigh's voyage to Guaiana, alſo ſpeaks of a people which that traveller found in the province of Irvipanama, between the lakes of Panama and Caſſipa, who had no head or neck; and Hondius, in his map, marks the place with the figures of theſe monſters. Yet De Laet* rejects the ſtory; being informed by others, that the inhabitants of the banks of the Caora, a river that flows out of the lake of Caſſipa, have their head ſo far ſunk between their ſhoulders, that many believed they had their eyes in their ſhoulders and their mouths in their breaſts.

* Deſcript. Amer. l. 17. c. 22.

But though the exiſtence of a nation of *Acephali* be ill warranted, naturaliſts furniſh ſeveral inſtances of individuals born without heads, by ſome luſus or aberration of nature. Wepfer gives † a catalogue of ſuch acephalous births, from Schenckius, Licetus, Paræus, Wolfius, Mauriceau, &c.

† In Eph. Ger. dec. 1. an. 3. obſ. 129. p. 184. Dec. 2. an. 9. obſer. 148. p. 258.

Acephalus, an obſolete term for the tænia or

Acephalus, Acer, the Maple-tree. tape-worm, which was long ſuppoſed to be acephalous. See TÆNIA. The firſt who gave it a head was Tulpius; and after him, Fehr: The former even makes it *biceps*, or two-headed.

ACEPHALUS, is alſo uſed to expreſs a verſe defective in the beginning.

ACER, the MAPLE or SYCAMORE TREE: a genus of the monœcia order, belonging to the polygamia claſs of plants; and ranking under the 23d Natural Order, *Trihilatæ*.—The generic characters, both natural and eſſential, are: The HERMAPHRODITE *calyx* is an acute, coloured, one-leav'd perianthium, divided into five ſegments, flat and entire at the baſe, and perſiſtent: The *corolla* is five-petal'd, ovate, and expanding: The *ſtamina* conſiſt of eight ſubulated ſhort filaments; the antheræ ſimple, the duſt cruciform: The *piſtillum* has a compreſſed germen, immerſed in the receptacle, which is convex, perforated, and large; the ſtylus is filiform; the ſtigmata are two, pointed, ſlender, and reflex: The *pericarpium* conſiſts of two or three capſulæ uniting at the baſe, roundiſh, compreſſed, each terminated with a large membranous wing: The *ſeeds* are ſolitary and roundiſh. The MALE *calyx*, *corolla*, and *ſtamina*, are the ſame as in the hermaphrodite: The *piſtillum* has no germen nor ſtylus; the ſtigma is bifid. [*Nota*, On the firſt opening of the flower, the *ſtigma* alone appears; a few days after, the *ſtylus*.—The hermaphrodite flowers on the ſame umbel are frequently of two ſorts: the inferior ones *feminine*, the antheræ of which do not burſt, but the piſtillum quickly grows into a fruit: the ſuperior ones *maſculine*, of which the antheræ ſcatter their pollen, but the piſtilla without increaſing fall off.]

Species, with their uſes and properties.] 1. The pſeudo-platanus, or ſycamore, is a very large and beautiful tree, with broad leaves, divided into five lobes ſerrated in their edges; of a dark-green colour on the upper ſide, but paler and ſomewhat hoary underneath; the flowers are very ſmall, and of a greeniſh white colour. The corolla of this ſpecies is ſcarcely diſtinguiſhable from the calyx, and the ſtamina are long. The fruit is large, and beautifully variegated with green and purple. This ſpecies is a native of Germany, but thrives very well in Great Britain, where it is frequent in plantations. It is very proper for making plantations near the ſea, or ſheltering ſuch as are already too near it; becauſe the ſycamore-tree reſiſts the ſpray of the ocean much better than moſt other trees. But it has this inconvenience, that its leaves are devoured by inſects, ſo as to become full of holes, and very unſightly; which has cauſed the planting of it to be much neglected of late. It has, however, long been conſidered as a timber tree in this country, having been much uſed by the turners for wooden bowls, diſhes, trenchers, &c.; but, ſince the cuſtom of uſing earthern ware has become ſo prevalent, its value for thoſe purpoſes has greatly decreaſed. There are two varieties, one with broad leaves and large keys, the other with variegated leaves. By tapping it yields a liquor not unlike that of the birch-tree; from which the Highlanders of Scotland ſometimes make an agreeable and wholeſome wine.

2. The campeſtris, or common maple, is too well known to need any particular deſcription, as it grows very frequently in hedge-rows in moſt parts of Britain. The timber of the common maple is far ſuperior to the beech for all the uſes of the turner. When it abounds with knots, as it frequently does, it is highly eſteemed by joiners for inlayings. It is alſo frequently employed for making muſical inſtruments, on account of its lightneſs; and for the whiteneſs of its wood was formerly eſteemed for making tables, &c. But the principal value of the maple is for underwood; it being of a quick growth, and affording good fuel.

Acer, the Maple-tree.

3. The negundo, or Virginian aſh-leaved maple, is a very ſtrong ſhooting tree; and in Virginia, where it is a native, is one of the largeſt trees of this kind. Its leaves are of a pale green, and well adapted to give a variety of tint; but Hanbury ſays, that this tree ought not to be planted in expoſed ſituations, the branches being ſubject to be ſplit off by the winds. Its uſes are ſimilar to thoſe of the ſycamore.

4. The platanoides, or Norway-maple, grows naturally in Norway, Sweden, and other northern countries of Europe. It riſes to a good height, and is well furniſhed with branches with ſmooth leaves, of a ſhining green colour, and beautifully indented. Theſe have an acrid milky juice, which prevents them from being preyed upon by inſects as the ſycamore is; and as this ſpecies reſiſts the ſpray of the ſea equally with the firſt, it is preferred in plantations ſituated near the ſea. In autumn the leaves dye to a golden yellow colour, which cauſes a delightful effect at that ſeaſon when the different tints of decaying vegetables are diſplayed. The flowers are alſo beautiful; they come out early in the ſpring, are of a fine yellow colour, and ſhow themſelves to advantage before the leaves come out. They are frequently ſucceeded by keys, which ſometimes arrive at maturity in this country. There is a variety with ſtriped leaves.

5. The rubrum, or Virginian ſcarlet flowering maple, is a native of that country, and never grows to a large ſize in Britain. It is, however, cultivated in gardens for the beauty of its flowers, which appear in the beginning of April, in roundiſh bunches, at the bottom of the footſtalks of the leaves. The ſeeds are ripe in five or ſix weeks after; and ought to be immediately ſown, being otherwiſe very apt to periſh. The tree ought to be ſheltered, eſpecially whilſt young, from the north-eaſt winds; it delights in a moiſt light ſoil, where it will thrive much better, as well as produce many more flowers and much better ſeeds, than in a dry ground. A variety of this tree is known in England by the name of *Sir Charles Wager's Flowering Maple*, from its being firſt ſent from America to Sir Charles Wager. The flowers of this kind come out in larger cluſters than the other, and ſurround the ſmall branches, ſo that the tree appears entirely covered with them, and makes a much more beautiful appearance than the former, which is now not ſo much eſteemed.

6. The ſaccharinum, or ſugar-maple, is a large growing tree; will arrive at the height of 40 feet; and has broad thin leaves, divided into five principal parts; which are again indented or cut at the edges into ſeveral acute ſegments. Their ſurface is ſmooth, of a light green colour, whitiſh underneath; and they grow on pretty long footſtalks. The flowers come out in the ſpring, about the time of the Norway maple; and they are ſucceeded by long keys, which ſometimes ripen in England. In America, the inhabitants tap this tree in the ſpring, boil the liquor, and the feces afford

ford a useful sugar. The sycamore, the ash-leaved, and the Norway maples, also abound with a saccharine juice, from which there is no doubt but a useful sugar might be prepared.

7. The Pensylvanicum, or American mountain-maple, very much resembles the sugar-maple, only its leaves are more pointed.

8. The opalus, or Italian maple, is very common in most parts of Italy, particularly about Rome; but in Britain is very rarely to be met with, though hardy enough to bear the open air. It is one of the largest species of trees in Italy, and affords a great shade by its numerous and large leaves. On this account it is planted on the road-sides, and near habitations.

9. The monspesulanum, or Montpelier maple, is common in the south of France, and in Italy; but is hardly met with in Britain. The leaves resemble those of the common maple; but are of a much thicker substance, a shining green colour, and not so large. They continue in verdure very late in the autumn, which renders the trees more valuable.

10. The creticum, or Cretan maple, grows naturally in the Levant; it somewhat resembles the last species; but its leaves are of a much thinner texture, and their footstalks covered with a soft hairy down; whereas those of the other are smooth and soft.

Propagation and culture.]—1. By *seeds*. The first four species are easily propagated in this way. The keys, when ripe in autumn, may be gathered, and in a few days after sown, about an inch and an half deep, in beds of common mould. In spring the plants will appear, and make a shoot of about a foot and an half by the autumn following, if the ground of the seminary be tolerably good, and they are kept free from weeds. The spring after they come up they should be planted in the nursery in rows two feet and an half asunder; and their distance in the rows must be one foot and an half. Here they may remain till they are big enough to plant out finally, with no further trouble than taking off unsightly side-branches, and such as have a tendency to make the tree forked, except digging between the rows, which must always be done every winter.——For the other species, their seeds, as they do not ripen in this country, ought to be procured from the places where they naturally grow, and managed in the following manner: A cool shady part of the seminary should be appropriated for the purpose; the mould should be made fine; beds should be marked out four feet wide, and in length proportionable to the quantity; and in these the seeds should be regularly sown, sifting over them about half an inch of the finest mould. When the plants come up, they must be kept clean from weeds, and frequently watered; and this work must be duly attended to all summer. The next spring, the strongest may be drawn out, and planted in the nursery, in rows two feet asunder, and at the distance of a foot from each other in the rows; leaving the others in the seminary to gain strength. The spring following they also must receive the same culture; and in the nursery they may remain, with no other trouble than keeping the ground clean from weeds in the summer, digging between the rows in the winter, and taking off all strong and irregular side-shoots till they are planted out. Trees raised from seeds will grow faster, and arrive at greater height, than those raised from layers: but they will not produce such quantities of flowers; which makes the latter method more eligible for those who want these plants for a low shrubbery.—Seeds of the variegated kinds also, when sown, will produce variegated plants in return; which renders the propagation of these sorts very expeditious where plenty of seeds may be had. Where these are not to be obtained, the plants are propagated by budding, as afterwards directed.

2. By *layers*. All the species may be propagated by this method; though it is never practised for the common maple and the sycamore. The young shoots may be at any time laid down in the autumn, winter, or early in the spring. By the autumn following, they will have struck root, and become good plants; when the strongest may be set out in the places where they are to remain; whilst the weakest may be planted in the nursery, like the seedlings, for a year or two, to acquire strength.

3. By *cuttings*: which method, however, is chiefly practised on the ash-leaved and Norway maples, which more readily take root this way. The cuttings should be the bottom parts of the last year's shoots: They should be taken off early in October, and planted in rows in a moist shady place. The spring and summer following, they must be duly watered as often as dry weather makes it necessary, and be kept clean from weeds. By the autumn they will be fit to remove into the nursery; though if the cuttings are not planted too close, they may remain in their situation for a year or two longer, and then be set out finally, without the trouble of being previously planted in the nursery.

4. By *budding*, *grafting*, and *inarching*. These methods are only practised for the variegated sorts and the large broad-leaved kind. The latter is to be continued no otherwise than by budding it on stocks of the common sycamore; for from the seeds, though so large themselves, only the common sycamore is produced.

In order to propagate these varieties by budding, let some plants of the common sycamore, one year old, be taken out of the seminary, and set in the nursery in rows a yard asunder, and the plants about a foot and a half distance from each other in the rows: Let the ground be kept clean from weeds all summer, and *turned in* in the winter; and the summer following the stocks will be of a proper size to receive the buds, which should be taken from the most beautifully-striped branches. The best time for this work is the middle or latter end of August. Having then budded your stocks with the eyes or buds fronting the north, early in October take off the bass-matting, which before this time will have confined the bark and pinched the bud, but not so as to hurt it much. Then cut off the stock just above the bud, and dig the ground between the rows. The summer following, keep the ground clean from weeds; cut off all natural side-buds from the stock as they come out; and by autumn, if the land is good, the buds will have shot forth, and formed themselves into trees five or six feet high. They may be then removed into the places where they are designed to remain; or a few of them only may be drawn out, leaving the others to be trained up for larger standards. The striped Norway maple should be budded on stocks of its own kind; for on these they take best, and both kinds are not very liable to run away from their colours. Variegated plants in general must be planted in

poor,

poor, hungry, gravelly, or ſandy ſoils, to feed the diſeaſe which occaſions theſe beautiful ſtripes, and cauſe it to be more powerful. But theſe trees ſhow their ſtripes in greater perfection in a good ſoil: The plant, though in ſickneſs, has the appearance of health; the ſhoots are vigorous and ſtrong; the leaves are large, leſs liable to be hurt by inſects; and the ſtripes appear more perfect, natural, and beautiful, than thoſe on ſtunted trees growing on a poor ſoil.

ACERB, a ſour rough aſtringency of taſte, ſuch as that of unripe fruit.

ACERNO, a town of Italy, in the citerior principality of Naples, with a biſhop's ſee. E. long. 15. 46. N. lat. 40. 50.

ACERINA, in Ichthyology, a name given by Pliny and other of the old naturaliſts, to the fiſh we at this time call the *ruffe*. See PERCA.

ACERRA, in antiquity, an altar erected, among the Romans, near the bed of a perſon deceaſed, on which his friends daily offered incenſe till his burial.—The real intention probably was to overcome any offenſive ſmell that might ariſe about the corpſe. The Chineſe have ſtill a cuſtom like this: they erect an altar to the deceaſed in a room hung with mourning; and place an image of the dead perſon on the altar, to which every one that approaches it bows four times, and offers oblations and perfumes.

The *Acerra* alſo ſignified a little pot wherein were put the incenſe and perfumes to be burnt on the altars of the gods and before the dead. It appears to have been the ſame with what was otherwiſe called *thuribulum*, and *pyxis*.

We find mention of *Acerræ* in the ancient church. The Jews had alſo their *Acerræ*, in our verſion rendered *cenſers;* and the Romaniſts ſtill retain them under the name of *incenſe-pots*. In Roman writers, we frequently meet with *plena acerra*, a full acerra: to underſtand which, it is to be obſerved, that people were obliged to offer incenſe in proportion to their eſtate and condition; the rich in larger quantities, the poor only a few grains; the former poured out *acerras* full on the altar, the latter took out two or three bits with their fingers.

ACERRA, a town of Italy, in the kingdom of Naples, and in the Terra di Lavoro; ſeated on the river Agno. E. Lon. 15. 10. N. lat. 40. 55.

ACERRÆ (anc. geog.), the ancient name of a town on the Clanius, in Campania, not far from Naples, now ACERRA.—The name alſo of another town, now called *la Girola*, in the territory and to the ſouth-eaſt of Lodi, where the rivulet Serio falls into the Adda, to the weſt of Cremona and north of Placentia.

ACESCENT, a word uſed to denote any thing which is turning ſour, or which is ſlightly acid. It is only applied properly to the former of theſe two meanings. The ſecond may be expreſſed by either of the two words, *acidulous* or *ſub-acid*.

ACETABULUM, in antiquity, a meaſure uſed by the ancients, equal to one-eighth of our pint. It ſeems to have acquired its name from a veſſel in which acetum or vinegar was brought to their tables, and which probably contained about this quantity.

ACETABULUM, in anatomy, a cavity in any bone for receiving the protuberant head of another, and thereby forming that ſpecies of articulation called ENARTHROSIS.

ACETABULUM, in botany, the trivial name of a ſpecies of the peziza, or cup-peziza, a genus belonging to the cryptogamia fungi of Linnæus. It has got the name of *acetabulum*, from the reſemblance its leaves bear to a cup. See PEZIZA.

ACETARY. Nehemiah Grew, in his anatomy of plants, applies this term to a pulpy ſubſtance in certain fruits, *e. g.* the pear, which is incloſed in a congeries of ſmall calculous bodies towards the baſe of the fruit, and is always of an acid taſte.

ACETOSA, Sorrel; by Linnæus joined to the genus of Dock, under the title of *Rumex*. See RUMEX.

ACETOSELLA, in botany, a ſpecies of OXALIS.

ACETOUS, an epithet applied to ſuch ſubſtances as are ſour or partake of the nature of vinegar.

ACETUM, VINEGAR, the vegetable ACID of the chemiſts. See VINEGAR.

ACHABYTUS (anc. geog.), a high mountain in Rhodes, on the top of which ſtood a temple of Jupiter.

ACHÆA (anc. geog.), a town of the iſland of Rhodes, in the diſtrict of Jalyſus, and the firſt and moſt ancient of all, ſaid to be built by the Heliades, or Grandſons of the Sun.

ACHÆA, a hamlet of Aſiatic Sarmatia on the Euxine. The inhabitants were called *Achæi*, a colony of the Orchomenians.

ACHÆANS, the inhabitants of ACHAIA Propria, a Peloponneſian ſtate. This republic was not conſiderable in early times, for the number of its troops, nor for its wealth, nor for the extent of its territories; but it was famed for its probity, its juſtice, and its love of liberty. Its high reputation for theſe virtues was very ancient. The Crotonians and Sybarites, to re-eſtabliſh order in their towns, adopted the laws and cuſtoms of the Achæans. After the famous battle of Leuctra, a difference aroſe betwixt the Lacedæmonians and Thebans, who held the virtue of this people in ſuch veneration, that they terminated the diſpute by their deciſion. The government of the Achæans was democratical. They preſerved their liberty till the time of Philip and Alexander: But in the reign of thoſe princes, and afterwards, they were either ſubject to the Macedonians, who had made themſelves maſters of Greece, or oppreſſed by cruel tyrants. The Achæan commonwealth conſiſted of twelve inconſiderable towns in Peloponneſus. Its firſt annals are not marked by any great action, for they are not graced with one eminent character. After the death of Alexander, this little republic was a prey to all the evils which flow from political diſcord. A zeal for the good of the community was now extinguiſhed. Each town was only attentive to its private intereſt. There was no longer any ſtability in the ſtate; for it changed its maſters with every revolution in Macedonia. Towards the 124th Olympiad, about the time when Ptolemy Soter died, and when Pyrrhus invaded Italy, the republic of the Achæans recovered its old inſtitutions and unanimity. The inhabitants of Patæ and of Dymæ were the firſt aſſerters of ancient liberty. The tyrants were baniſhed, and the towns again made one commonwealth. A public council was then held, in which affairs of importance were diſcuſſed and determined. A regiſter was

was appointed to record the tranſactions of the council. This aſſembly had two preſidents, who were nominated alternately by the different towns. But inſtead of two preſidents, they ſoon elected but one. Many neighbouring towns which admired the conſtitution of this republic, founded on equality, liberty, the love of juſtice, and of the public good, were incorporated with the Achæans, and admitted to the full enjoyment of their laws and privileges.—The arms which the Achæans chiefly uſed were ſlings. They were trained to the art from their infancy, by ſlinging from a great diſtance, at a circular mark of a moderate circumference. By long practice they took ſo nice an aim, that they were ſure, not only to hit their enemies on the head, but on any part of the face they choſe. Their ſlings were of a different kind from thoſe of the Balearians, whom they far ſurpaſſed in dexterity.

ACHÆI, (Achæans); the inhabitants of Achaia Propria. In Livy, the people of Greece; for the moſt part called *Achivi*, by the Roman poets. In Homer, the general name for Grecians. See ACHÆANS.

ACHÆORUM PORTUS, (Pliny); now *Porto Buon*, a harbour of the Cherſoneſus Taurica, on the Euxine. Another, near Sigæum, into which the Xanthus, after being joined by the Simois, falls.

ACHÆMENES, according to Herodotus, was father of Cambyſes, and grandfather of Cyrus the firſt, king of Perſia. Moſt of the commentators of Horace are of opinion, that the Achæmenes whom that poet mentions, ode xii. of his 2d book, was one of the Perſian monarchs: but, if that were true, he muſt have reigned before the Medes ſubdued the Perſians; for we do not hear of any king of that name from the time that the Perſians founded that great monarchy, which is looked upon as the ſecond univerſal one. However this be, the epithet *Achæmenians* is frequently given to the Perſians, in the old Latin poets.

ACHÆMENES, ſon of Darius I. king of Perſia, and brother of Xerxes, had the government of Egypt beſtowed on him, after Xerxes had forced the Egyptians to return to their allegiance. He ſome time after commanded the Egyptian fleet in the celebrated expedition which proved ſo fatal to all Greece, The Egyptians having again taken up arms after the death of Xerxes, Achæmenes was ſent into Egypt to ſuppreſs the rebellion; but was vanquiſhed by Inarus, chief of the rebels, ſuccoured by the Athenians.

ACHÆUS, couſin-german to Seleucus Ceraunus and Antiochus the Great, kings of Syria, became a very powerful monarch, and enjoyed the dominions he had uſurped for many years; but at laſt he was puniſhed for his uſurpations in a dreadful manner, in the 140th year of Rome, as related by Polybius*.

* Lib. viii. cap. 5. 6.

ACHAIA, a name taken for that part of Greece which Ptolemy calls *Hellas*; the younger Pliny, *Græcia*; now called *Livadia*: bounded on the north by Theſſaly, the river Sperchius, the Sinus Maliacus, and mount Oeta; on the weſt by the river Achelous; on the eaſt, turning a little to the north, it is waſhed by the Archipelago, down to the promontory of Sunium; on the ſouth, joined to the Peloponneſus, or Morea, by the iſthmus of Corinth, five miles broad.

ACHAIA Propria, anciently a ſmall diſtrict in the north of Peloponneſus, running weſtward along the bay of Corinth, and bounded on the weſt by the Ionian Sea, on the ſouth by Elis and Arcadia, and on the eaſt by Sicyonia: inhabitants, the *Achæans*, properly ſo called; its metropolis, *Patræ*. It is now called *Romania Alta*, in the Morea.

Achaia was alſo taken for all thoſe countries that joined in the Achæan league, reduced by the Romans to a province. Likewiſe for Peloponneſus.

ACHAIÆ Preſbyteri, or the Preſbyters of Achaia, were thoſe who were preſent at the martyrdom of St Andrew the Apoſtle, A. D. 59; and are ſaid to have written an epiſtle in relation to it. Bellarmin, and ſeveral other eminent writers in the church of Rome, allow it to be genuine; while Du Pin, and ſome others, expreſsly reject it.

ACHAIUS, ſon of Ethwin, was raiſed to the crown of Scotland, A. D. 788. The emperor Charlemagne ſent an embaſſay to deſire an alliance with him againſt the Engliſh, whoſe pirates ſo infeſted the ſeas, that the merchants could not carry on their trade. This alliance was concluded in France upon conditions ſo advantageous to the Scots, that Achaius, to perpetuate the memory of it, added to the arms of Scotland a double field ſowed with lilies. He died in 819.

ACHALALACTLI, in ornithology, a ſpecies of king's-fiſher. See ALCEDO.

ACHAN, the ſon of Carmi, of the tribe of Judah, at the taking of Jericho concealed two hundred ſhekels of ſilver, a Babyloniſh garment, and a wedge of gold, contrary to the expreſs command of God. This ſin proved fatal to the Iſraelites, who were repulſed at the ſiege of Ai. In this dreadful exigence, Joſhua proſtrated himſelf before the Lord, and begged that he would have mercy upon his people. Achan was diſcovered by caſting lots, and he and his children were ſtoned to death. This expiation being made, Ai was taken by ſtratagem. Joſh. vii. 8, 9.

ACHANE, an ancient Perſian corn meaſure, containing 45 Attic medimni.

ACHARACA, anciently a town of Lydia, ſituate between Tralles and Nyſa; in which were the temple of Pluto, and the cave Charonium, where patients ſlept in order to obtain a cure.

ACHAT, in law, implies a purchaſe or bargain. And hence probably purveyors were called *Achators*, from their making bargains.

ACHATES, the companion of Eneas, and his moſt faithful friend, celebrated in Virgil.

ACHATES, in natural hiſtory. See AGATE.

ACHATES (anc. geog.), a river of Sicily, now the *Drillo*; which runs from north to ſouth, almoſt parallel with, and at no great diſtance from, the Gela; and riſes in the north of the territory of Noto. It gave name to the Achates, or Agate, ſaid to be firſt found there.

ACHAZIB, or ACHZIB, (anc. geog.), a town of Galilee, in the tribe of Aſher, nine miles from Ptolemais.—Alſo a town in the more ſouthern parts of the tribe of Judah.

ACHEEN, ACHE', or ACHEN, a kingdom of Sumatra in the Eaſt-Indies, ſituated on the north-weſtern part of the iſland.

The capital is ſituated on a river which empties itſelf near the north-weſt point, or Acheen-head, about two miles from the mouth. It lies in a wide valley, formed

Acheen. formed like an amphitheatre by two lofty ranges of hills. The river is not large, and by emptying itſelf in ſeveral channels is rendered very ſhallow at the bar. In the dry monſoon it will not admit boats of any burthen, much leſs large veſſels, which lie without, in the road formed by the iſlands off the point. Though no longer the great mart of eaſtern commodities, it ſtill carries on a conſiderable trade with the natives of that part of the coaſt of Indoſtan called *Telinga*, who ſupply it with the cotton goods of their country, and receive in return, gold-duſt, ſapan-wood, betel-nut, patch-leaf (*colſus Indicus*), a little pepper, ſulphur, camphire, and benzoin. The country is ſupplied with Bengal opium, and alſo with iron, and many other articles of merchandize, by the European traders.

Acheen is eſteemed, comparatively, healthy, being more free from woods and ſwamps than moſt other portions of the iſland; and the fevers and dyſenteries to which theſe are ſuppoſed to give occaſion, are there ſaid to be uncommon. The ſoil is light and fertile; and the products, beſide thoſe already enumerated as articles of export trade, and a variety of fine fruits, are chiefly rice and cotton. There is likewiſe ſome raw ſilk procured in the country, of very inferior quality. Gold duſt is collected in the mountains near Acheen, but the greateſt part is brought from the ſouthern ports of Nalaboo and Soofoo. The ſulphur is gathered from a volcano mountain in the neighbourhood, which ſupplies their own conſumption for the manufacture of gun-powder, and admits of a large exportation.

In their perſons, the Achcneſe differ from the reſt of the Sumatrans, being taller, ſtouter, and darker complexioned. They appear not to be a genuine people; but are thought, with great appearance of reaſon, to be a mixture of Battas, Malays, and Moors from the weſt of India. In their diſpoſitions they are more active and induſtrious than their neighbours; they poſſeſs more penetration and ſagacity; have more general knowledge; and as merchants, they deal upon a more extenſive and liberal footing. Their religion is Mahometaniſm; and having a great number of moſques and prieſts, its forms and ceremonies are ſtrictly obſerved.

The appearance of the town, and the nature of the buildings, are much the ſame as are found in the generality of Malay bazars, excepting that the ſuperior wealth of this place has occaſioned a great number of public edifices, but without the ſmalleſt pretenſions to magnificence. The king's palace, if it deſerves the appellation, is a very rude and uncouth piece of architecture, deſigned to reſiſt the force of an enemy, and ſurrounded for that purpoſe by ſtrong walls, but without any regular plan, or view to the modern ſyſtem of military attack. The houſes in common are built of bamboos and rough timber, and raiſed ſome feet from the ground on account of the place being overflowed in the rainy ſeaſon.

A conſiderable fabrick of a thick ſpecies of cotton cloth, and of ſtuff for the ſhort drawers worn both by Malays and Acheneſe, is eſtabliſhed here, and ſupplies an extenſive demand. They weave alſo very handſome ſilk pieces, of a particular form, for that part of the dreſs which is called by the Malays *cayen ſarrong*.

The Acheneſe are expert and bold navigators, and employ a variety of veſſels, according to the voyages they undertake, and the purpoſes for which they deſign them. The river is covered with a multitude of fiſhing ſampans or canoes, which go to ſea with the morning breeze, and return in the afternoon, with the ſea wind, full laden.

Having no convenient coins, though moſt ſpecies of money will be taken there at a valuation, they commonly make their payments in gold duſt, and for that purpoſe are all provided with ſcales or ſmall ſteelyards. They carry their gold about them, wrapped up in pieces of bladder, and often purchaſe to ſo ſmall an amount, as to make uſe of grain or ſeeds for weights.

The monarchy is hereditary; and the king uſually maintains a guard of 100 Seapoys about his palace.

According to Mr Marſden, " the grand council of the nation conſiſts of, the King or *Sultan*, four *Oolooballangs*, and eight of a lower degree, who ſit on his right hand, and ſixteen *Cajoorangs*, who ſit on his left. At the king's feet ſits a woman, to whom he makes known his pleaſure: by her it is communicated to an eunuch, who ſits next to her, and by him to an officer named *Cajoorang Gondong*, who then proclaims it aloud to the aſſembly. There are alſo preſent two other officers, one of whom has the government of the *bazar* or market, and the other the ſuperintending and carrying into execution the puniſhment of criminals. All matters relative to commerce and the cuſtoms of the port come under the juriſdiction of the *Shabandar*, who performs the ceremony of giving the *chap* or licence for trade; which is done by lifting a golden-hafted creeſe over the head of the merchant who arrives, and without which he dares not to land his goods. Preſents, the value of which are become pretty regularly aſcertained, are then ſent to the king and his officers. If the ſtranger be in the ſtyle of an ambaſſador, the royal elephants are ſent down to carry him and his letters to the monarch's preſence; theſe being firſt delivered into the hands of an eunuch, who places them in a ſilver diſh, covered with rich ſilk, on the back of the largeſt elephant, which is provided with a machine (*houler*) for that purpoſe. Within about an hundred yards of an open hall where the king ſits, the cavalcade ſtops, and the ambaſſador diſmounts, and makes his obeiſance by bending his body, and lifting his joined hands to his head. When he enters the palace, if an European, he is obliged to take off his ſhoes; and having made a ſecond obeiſance, is ſeated upon a carpet on the floor, where *betel* is brought to him. The throne was ſome years ago of ivory and tortoiſeſhell, and when the place was governed by queens, a curtain of gauze was hung before it, which did not obſtruct the audience, but prevented any perfect view. The ſtranger, after ſome general diſcourſe, is then conducted to a ſeparate building, where he is entertained with the delicacies of the country, by the officers of ſtate, and in the evening returns in the manner he came, ſurrounded by a prodigious number of lights. On high days (*aree ryah*) the king goes in great ſtate mounted on an elephant richly capariſoned, to the great moſque, preceded by his *oolooballangs*; who are armed nearly in the European manner."

The country under the immediate juriſdiction of Acheen, is divided into three diſtricts, named *Duo*

pooloo

pooloo duo, *Duo pooloo leemo*, and *Duo pooloo anam*. Each diſtrict is governed by a Pangleemo, and under him an Imaum and four Pangeeches to each moſque.

"Achen has ever been remarkable for the ſeverity with which crimes are puniſhed by their laws; the ſame rigour ſtill ſubſiſts, and there is no commutation admitted, as is regularly eſtabliſhed in the ſouthern countries. There is great reaſon, however, to conclude, that the poor alone experience the rod of juſtice; the nobles being ſecure from retribution in the number of their dependants. Petty theft is puniſhed by ſuſpending the criminal from a tree, with a gun or heavy weight tied to his feet; or by cutting off a finger, a hand, or leg, according to the nature of the theft. Many of theſe mutilated and wretched objects are daily to be ſeen in the ſtreets. Robbery on the highway and houſe-breaking are puniſhed by drowning, and afterwards expoſing the body on a ſtake for a few days. If the robbery is committed upon an imaum or prieſt, the ſacrilege is expiated by burning the criminal alive. A man who is convicted of adultery is ſeldom attempted to be ſcreened by his friends, but is delivered up to the friends and relations of the injured huſband. Theſe take him to ſome large plain, and forming themſelves in a circle, place him in the middle. A large weapon called a *Gadoobong*, is then delivered to him by one of his family; and if he can force his way through thoſe who ſurround him, and make his eſcape, he is not liable to further proſecution; but it commonly happens that he is inſtantly cut to pieces. In this caſe his relations bury him as they would a dead buffalo, refuſing to admit the corpſe into their houſe, or to perform any funeral rites." Theſe diſcouragements to vice might ſeem to beſpeak a moral and virtuous people: yet all travellers agree in repreſenting the Acheneſe as one of the moſt diſhoneſt and flagitious nations of the Eaſt.

Achen was viſited by the Portugueſe in 1509, only 12 years after they had diſcovered the paſſage to the Eaſt-Indies by the Cape of Good Hope. They made various attempts to eſtabliſh themſelves in the country, but were expelled with diſgrace. See Summatra.

ACHELOUS, in fabulous hiſtory, wreſtled with Hercules, for no leſs a prize than Deianira, daughter to king Oenus: but as Achelous had the power of aſſuming all ſhapes, the conteſt was long dubious: at laſt, as he took that of a bull, Hercules tore off one of his horns; ſo that he was forced to ſubmit, and to redeem it by giving the conqueror the horn of Amalthea, the ſame with the Cornucopia or horn of plenty; which Hercules having filled with a variety of fruits, conſecrated to Jupiter. Some explain this fable, by ſaying, That Achelous is a winding river of Greece, whoſe ſtream was ſo rapid, that it roared like a bull, and overflowed its banks; but Hercules, by bringing it into two channels, broke off one of the horns, and ſo reſtored plenty to the country. *See the next article.*

Achelous, a river of Acarnania; which riſes in mount Pindus, and, dividing Ætolia from Acarnania, falls from north to ſouth into the Sinus Corinthiacus. It was formerly called *Thoas*, from its impetuoſity, and *king of rivers*, (Homer.) The epithet *Acheloius* is uſed for *Aqueus*, (Virgil); the ancients calling all water *Achelous*, eſpecially in oaths, vows, and ſacrifices, according to Ephorus: Now called *Aſpro Potamo*. Rivers are by the ancient poets called *Tauriformes*, either from the bellowing of their waters, or from their ploughing the earth in their courſe: Hercules, reſtraining by dykes and mounds the inundations of the *Achelous*, is ſaid to have broken off one of his horns, and to have brought back plenty to the country. *See the preceding article.*

ACHERI (Luke d'), a learned Benedictine of the congregation of St Maur, was born at St Quintin, in Picardy, in 1609; and made himſelf famous by printing ſeveral works, which till then were only in manuſcript: particularly, The epiſtle attributed to St Barnabas; The works of Lanfrank, archbiſhop of Canterbury; A collection of ſcarce and curious pieces, under the title of Spicilegium, *i. e.* Gleanings, in thirteen volumes, quarto. The prefaces and notes, which he annexed to many of theſe pieces, ſhow him to have been a man of genius and abilities. He had alſo ſome ſhare in the pieces inſerted in the firſt volumes of The acts of the ſaints of the order of St Bennet; the title whereof acquaints us that they were collected and publiſhed by him and father Mabillon. After a very retired life, till the age of 73, he died at Paris the 29th of April 1685, in the abbey of St Germain in the fields, where he had been librarian.

ACHERNER, or Acharner, a ſtar of the firſt magnitude in the ſouthern extremity of the conſtellation Eridanus, but inviſible in our latitude.

ACHERON, a river of Epirus. The poets feigned it to have been the ſon of Ceres, whom ſhe hid in hell for fear of the Titans, and turned into a river, over which ſouls departed were ferried in their way to Elyſium.

Acheron, a river of Theſprotia, in Epirus; which, after forming the lake Acheruſia, at no great diſtance from, falls into the ſea near, the promontory of Chimerium, to the weſt of the Sinus Ambracius, in a courſe from north to ſouth.

Acheron, or Acheros, a river of the Bruttii in Italy, running from eaſt to weſt; where Alexander king of Epirus was ſlain by the Lucani, being deceived by the oracle of Dodona, which bid him beware of Acheron.

ACHERSET, an ancient meaſure of corn, conjectured to be the ſame to our quarter, or eight buſhels.

ACHERUSIA palus, a lake between Cumæ and the promontory Miſenum, now *il Lago Della Collucia*, (Cluverius.) Some confound it with the *Lacus Lucrinus*, and others with the *Lacus Averni*. But Strabo and Pliny diſtinguiſh them. The former takes it to be an effuſion, exundation, or waſhes of the ſea, and therefore called by Lycophron, Αχηρυσια χυσις.—Alſo a lake of Epirus, through which the Acheron runs.—There is alſo an *Acheruſia*, a peninſula of Bithynia on the Euxine, near Heraclea; and a cave there of the ſame name, through which Hercules is fabled to have deſcended to hell to drag forth Cerberus.

ACHIAR, is a Malayan word, which ſignifies all ſorts of fruits and roots pickled with vinegar and ſpice. The Dutch import from Batavia all ſorts of achiar, but particularly that of Bamboo (ſee Arundo), a kind of cane, extremely thick, which grows in the Eaſt Indies. It is preſerved there, whilſt it is ſtill green, with very ſtrong vinegar and ſpice; and is called *bamboo-achiar*. The name changes according to the fruit with which the achiar is made.

ACHICOLUM, is uſed to expreſs the *fornix*, *tholus*,

Achillæa. *lus*, or *ſudatorium* of the ancient baths; which was a hot room where they uſed to ſweat. It is alſo called *architholus*.

ACHILLÆA, Yarrow, Milfoil, Nosebleed, or Sneezewort; a genus of the order of the polygamia ſuperflua, belonging to the ſyngeneſia claſs of plants. The natural order to which it belongs is the 49th, *Compoſitæ diſcoides*.

The characters are: The common *calyx* is ovate and imbricated, with ovate, acute, converging ſcales. The *compound corolla* is rayed; the hermaphrodite corollets are tubular in the diſc, the feminine linguiform and from 5 to 10 in the rays: The *proper corolla* of the hermaphrodites is funnel-ſhaped, expanded, and divided into 5 ſegments; that of the females, tongue-ſhaped, inverſely cordated, expanding, and of 3 ſegments. The *ſtamina* in the hermaphrodites conſiſt of 5 very ſhort capillary filaments; the anthera is cylindric and tubular. The *piſtillum* in the hermaphrodites has a ſmall germen; the ſtylus is filiform the length of the ſtamina; the ſtigma is obtuſe and end-notched: in the females, the germen is ſmall; the ſtylus is filiform; the ſtigmata are 2, obtuſe and reflected. The *pericarpium* is wanting; the calyx ſcarcely changed; the receptacle filiform, elongated at the diſc of the ſeeds, ovate, and twice as long as the calyx. The *ſeeds* are ſolitary, ovate, and furniſhed with a lock of wool; no pappus. The *receptaculum* is chaffy and elevated.

Species and properties. There are 20 ſpecies, of which the following are the principal: 1. The millefolium, or common yarrow, is found naturally on banks, and by the ſides of foot-paths, in moſt parts of England. It moſt commonly bears white flowers, though a variety of it is found which bears purple ones. Theſe, however, do not long continue to bear flowers of this colour, if tranſplanted into gardens. It was formerly uſed in medicine; but though it may ſtill have a place in ſome diſpenſatories, no phyſician of any note expects any virtue from it, or ever preſcribes it. It creeps greatly by its roots, and alſo multiplies by the ſeeds, ſo that it becomes a troubleſome weed where it is once allowed to get a footing. The cultivation of it is recommended by Mr Anderſon, in his Eſſays on Agriculture, as a proper food for cattle. This ſpecies was the proper achillæa of the ancients, ſo named from Achilles; who, having been the diſciple of Chiron, firſt brought it into uſe for the cure of wounds and ulcers. 2. The ſantolina, or eaſtern ſneezewort, is ſometimes cultivated in gardens; it has large yellow flowers, which ſtand upon pretty long footſtalks placed ſingly, not in bunches as in the common kind. It has leaves like lavender-cotton, which, when rubbed, emit a ſtrong oily odour. The flowers appear in June and July. 3. The tomentoſa, or woolly yarrow, is a native of the ſouth of France and Spain, but lives in the open air in England. The flowers are of a bright yellow, and continue long in beauty, growing in cluſters at the top of the ſtalks, which ſeldom riſe above a foot high. The leaves are finely cut, and very hoary. 4. The abrotanifolia, or tall eaſtern yarrow, is a native of the iſlands in the Archipelago: it grows to the height of two feet and a half, with large umbels of yellow flowers on the top; the leaves reſemble thoſe of the common wormwood, and are cut into long narrow ſegments. 5. The clavenna, or Alpine umbelliferous wormwood, takes its name from the mountains of which it is a native. It ſeldom grows above ſix or ſeven inches in height; it ſupports umbels of white flowers, like thoſe of the common ſneezewort, which appear in April and May. The leaves are ſilvery, and ſhaped like thoſe of wormwood, which often decay in the autumn and winter. 6. The tanacetifolia, or eaſtern ſneezewort, with tanſey leaves, is a very humble plant, ſeldom riſing above ſix inches in height. The flowers are nearly as large as thoſe of the common ſneezewort, white, and growing in flat umbels. They appear in June and July. The leaves of the plant have ſome likeneſs to thoſe of the common wormwood, are very hoary, grow cloſe to the ground, and decay in autumn ſo as to make little appearance in winter. Like the laſt ſpecies, this is a native of the Alps. 7. The ageratum, or ſweet maudlin, was formerly much uſed in medicine and for culinary purpoſes, but has now fallen ſo much into neglect as to be totally unknown in the markets; ſo that when it is demanded, the white maudlin is ſubſtituted in its ſtead. The reaſon of this ſubſtitution was, that the latter is more hardy and eaſily propagated than the ſweet maudlin, which is apt to rot in wet winters. The common maudlin flowers in June and July, and the ſeeds are ripe in September. 8. The Egyptiaca, or hoary ſneezewort, is a native of the Archipelago. It hath very hoary leaves, which remain all the year; and the plants growing cloſe and low, make a pretty appearance at all ſeaſons. The flowers are yellow, and are produced in umbels on the top of the ſtalks; they appear in June, and continue till the end of September. 9. The ptarmica, or common ſneezewort, grows wild in the woods, and other ſhady places, in many parts of England; ſo is not admitted into gardens. There is a variety, however, with double flowers, which is preſerved in gardens, and is commonly known by the name of *double maudlin*. This ſpecies creeps greatly by the roots, ſo as ſoon to overſpread a large ſpot of ground. If planted in pots, ſo as to confine its roots from creeping, the ſtalks grow cloſe together, and make a tolerable appearance when in flower; but when at a diſtance, ſo that the roots have full liberty to run, the flowers appear but indifferently. 10. The macrophylla, or Alpine ſneezewort, with feverfew leaves, is a native of the Alps. It produces many ſtalks riſing near three feet high; having looſe branching umbels of white flowers on their top, reſembling thoſe of the common ſneezewort, but larger. 11. The nana, or hoary Alpine milfoil, is likewiſe a native of the Alps; the leaves are hoary, and the umbels of its flowers are more compact than the former; the ſtalks do not riſe more than a foot high. 12. The nobilis, or ſweet milfoil, approaches to the nature of the common milfoil; but its leaves are of a paler green, and are neither ſo long nor ſo much cut off as thoſe of the common milfoil are: they have a ſtrong ſweet ſcent when bruiſed. 13. The alpina, or white maudlin, bears ſome reſemblance to the common ſneezewort; but the leaves are longer, of a deeper green colour, and deeply indented in their edges; the flowers are white, and the roots creep far under ground. The plant will riſe, in good land, to the height of four feet.

Culture. All the ſorts of yarrow are eaſily propagated by ſeeds, which may be ſown either in the ſpring or

or autumn, upon a bed of common earth. When the plants come up, and are ftrong enough for tranfplanting, they fhould be planted in beds in the nurfery, where they may continue till autumn, when they fhould be tranfplanted to the places where they are to remain. The Archipelago kinds, however, are often deftroyed by fevere froft; fo they ought to be fheltered during the winter. Thefe kinds alfo rarely bring their feeds to perfection in England; they are therefore to be propagated by flips, which may be taken off and planted in a fhady border any time in fummer, when they will take root in about fix weeks, and then may be tranfplanted where they are to remain.

ACHILLEID, Achilleis, a celebrated poem of Statius, in which that author propofed to deliver the whole life and exploits of Achilles; but being prevented by death, he has only treated of the infancy and education of his hero. See Statius.

ACHILLES, one of the greateft heroes of ancient Greece, was the fon of Peleus and Thetis. He was a native of Phthia, in Theffaly. His mother, it is faid, in order to confume every mortal part of his body, ufed to lay him every night under live coals, anointing him with ambrofia, which preferved every part from burning but one of his lips, owing to his having licked it. She dipped him alfo in the waters of the river Styx; by which his whole body became invulnerable, except that part of his heel by which fhe held him. But this opinion is not univerfal, nor is it a part of his character as drawn by Homer; for in the Iliad (B. xxi. 161.) he is actually wounded in the right arm, by the lance of Afteropaus, in the battle near the river Scamander. Thetis afterwards intrufted him to the care of the centaur Chiron, who, to give him the ftrength neceffary for martial toil, fed him with honey and the marrow of lions and wild boars. To prevent his going to the fiege of Troy, fhe difguifed him in female apparel, and hid him among the maidens at the court of king Lycomedes: but Ulyffes difcovering him, perfuaded him to follow the Greeks. Achilles diftinguifhed himfelf by a number of heroic actions at the fiege. Being difgufted, however, with Agamemnon for the lofs of Brifeis, he retired from the camp. But returning to avenge the death of his friend Patroclus, he flew Hector, faftened his corps to his chariot, and dragged it round the walls of Troy. At laft Paris, the brother of Hector, wounded him in the heel with an arrow, while he was in the temple treating about his marriage with Philoxena, daughter to king Priam. Of this wound he died, and was interred on the promontory of Sigæum; and after Troy was taken, the Greeks facrificed Philoxena on his tomb, in obedience to his defire, that he might enjoy her company in the Elyfian fields. It is faid, that Alexander, feeing this tomb, honoured it by placing a crown upon it; at the fame time crying out, that "Achilles was happy in having, during his life, fuch a friend as Patroclus; and, after his death, a poet like Homer." Achilles is fuppofed to have died 1183 years before the Chriftian æra.

Achilles Tatius. See Tatius.

Tendo Achillis, in anatomy, is a ftrong tendinous cord formed by the tendons of feveral mufcles, and inferted into the os calcis. It has its name from the fatal wound Achilles is faid to have received in that part from Paris the fon of Priam.

ACHILLINI (Alexander), born at Bologna, and doctor of philofophy in that univerfity. He flourifhed in the 15th and 16th centuries, and by way of eminence was ftyled the Great Philofopher. He was a ftedfaft follower and accurate interpreter of Averroes upon Ariftotle, but moft admired for his acutenefs and ftrength of arguing in private and public difputations. He made a furprifing quick progrefs in his ftudies, and was very early promoted to a profefforfhip in the univerfity; in which he acquitted himfelf with fo much applaufe that his name became famous throughout all Italy. He continued at Bologna till the year 1506; when the univerfity of Padua made choice of him to fucceed Antonio Francatiano in the firft chair of philofophy, and his fame brought vaft numbers of ftudents to his lectures at Padua: but the war, wherein the republic of Venice was engaged againft the league of Cambray, putting a ftop to the lectures of that univerfity, he withdrew to his native country; where he was received with the fame marks of honour and diftinction as before, and again appointed profeffor of philofophy in Bologna. He fpent the remainder of his life in this city, where he died, and was interred with great pomp in the church of St Martin the Great, which belongs to the Carmelite friars. Jovius, who knew Achillini, and heard his lectures, fays, that he was a man of fuch exceeding fimplicity, and fo unacquainted with addrefs and flattery, that he was a laughing-ftock to the pert and faucy young fcholars, although efteemed on account of his learning. He wrote feveral pieces on philofophical fubjects, which he publifhed, and dedicated to John Bentivogli.

Achillini (Claudius), grandfon of the former, read lectures at Bologna, Ferrara, and Parma; where he was reputed a great philofopher, a learned divine, an excellent lawyer, an eloquent orator, a good mathematician, and an elegant poet. He accompanied Cardinal Ludovino, who went as legate into Piedmont; but being afterward neglected by this cardinal, when he became pope under the name of Gregory XV. he left Rome in difguft, and retired to Parma; where the duke appointed him profeffor of law, with a good falary. He publifhed a volume of Latin Letters, and another of Italian poems, which gained him great reputation: he died in 1640, aged 66.

ACHIOTTE, or Achiotl, a foreign drug, ufed in dying, and in the preparation of chocolate. It is the fame with the fubftance more ufually known by the name of Arnotto; which fee.

ACHIROPŒTOS, a name given by ancient writers to certain miraculous pictures of Chrift and the Virgin, fuppofed to have been made without hands.—The moft celebrated of thefe is the picture of Chrift, preferved in the church of St John Lateran at Rome; faid to have been begun by St Luke, but finifhed by the miniftry of angels.

ACHMET, fon of Seerim, has left a book concerning the interpretation of dreams according to the doctrine of the Indians, Perfians, and Egyptians, which was tranflated out of Greek into Latin by Leo Tufcus in 1160. He lived in the 9th century.

ACHMET GEDUC, a famous general under Mahomet II. and Bajazet II. in the 15th century. When Mahomet II. died, Bajazet and Zezan both claimed the throne: Achmet fided with the former, and by his

bravery and conduct fixed the crown on his head. But Bajazet took away his life; fhining virtue being always an unpardonable crime in the eyes of a tyrant.

ACHMETSCHET, a town of the peninfula of the Crimea, the refidence of the fultan Galga, who is eldeft fon of the Khan of Tartary. Long. 51. 20. Lat. 45. 0.

ACHMIM, a large town of Upper Egypt, fituated on the eaftern bank of the Nile. "One admires there (fays Abulfeda, as quoted by Mr Savary) a temple, which is comparable to the moft celebrated monuments of antiquity. It is conftructed with ftones of a furprifing fize, on which are fculptured innumerable figures." Though this town be fallen from its ancient fplendor, it is ftill one of the moft beautiful of Upper Egypt. According to Mr Savary, an Arab prince commands there, and the police is well attended to. The ftreets are wide and clean, and commerce and agriculture flourifh. It has a manufactory of cotton, ftuffs, and pottery, which are conveyed over all Egypt. It is the fame that Herodotus calls *Chemmis*, and Strabo *Panopolis*, or the city of Pan, who was worfhipped there. Herodotus fays, that Perfeus was a native of this city, and that his defcendants had eftablifhed feftivals there in his honour. It has loft its ancient edifices, and much of its extent; the ruins of the temple, defcribed by Abulfeda, being without its limits, to the north. Nothing remains of it but fome ftones, of fuch magnitude that the Turks have not been able to move them. They are covered with hieroglyphics. On one of them are traced four concentric circles, in a fquare. The innermoft of thefe contains a fun. The two fucceeding ones, divided into 12 parts, contain, one, 12 birds, the other, 12 animals almoft effaced, which appear to be the figns of the zodiac. The fourth has no divifions, and prefents 12 human figures; which Mr Savary imagines to reprefent the 12 gods, the 12 months of the year, and the 12 figns of the zodiac. The Egyptians, fays Herodotus, are the firft who divided the year into 12 months, and employed the names of the 12 gods. The four feafons occupy the angles of the fquare, on the fide of which may be diftinguifhed a globe with wings. Mr Savary thinks it probable that this ftone belonged to a temple dedicated to the fun, that the whole of thefe hieroglyphics mark his paffage into the figns of the zodiac, and his courfe, whofe revolution forms the year. The columns of this temple have been partly broken to make lime and millftones. Some of them have been tranfported into one of the mofques of Achmim, where they are placed without tafte; others are heaped up in the fquares of the town.

Mr Savary tells us of a ferpent which is worfhipped here, and is the wonder of the country. "Upwards of a century ago (fays he), a religious Turk called *Scheilk Haridi* died here. He paffed for a faint among the Mahometans; who raifed a monument to him, covered with a cupola, at the foot of the mountain. The people flocked from all parts to offer up their prayers to him. One of their priefts, profiting by their credulity, perfuaded them that God had made the foul of Scheilk Haridi pafs into the body of a ferpent. Many of thefe are found in the Thebais, which are harmlefs; and he had taught one to obey his voice. He appeared with his ferpent, dazzled the vulgar by his furprifing tricks, and pretended to cure all diforders. Some lucky inftances of fuccefs, due to nature alone, and fometimes to the imagination of the patients, gave him great celebrity. He foon confined his ferpent Haridi to the tomb, producing him only to oblige princes and perfons capable of giving him a handfome recompence. The fucceffors of this prieft, brought up in the fame principles, found no difficulty in giving fanction to fo advantageous an error. They added to the general perfuafion of his virtue that of his immortality. They had the boldnefs even to make a public proof of it. The ferpent was cut in pieces in prefence of the Emir, and placed for two hours under a vafe. At the inftant of lifting up the vafe, the priefts, no doubt, had the addrefs to fubftitute one exactly refembling it. A miracle was proclaimed, and the immortal Haridi acquired a frefh degree of confideration. This knavery procures them great advantages. The people flock from all quarters to pray at this tomb; and if the ferpent crawls out from under the ftone, and approaches the fuppliant, it is a fign that his malady will be cured. It may be imagined, that he does not appear till an offering has been made proportioned to the quality and riches of the different perfons. In extraordinary cafes, where the fick perfon cannot be cured without the prefence of the ferpent, a *pure virgin* muft come to folicit him. To avoid inconveniences on this head, they take care to choofe a *very young girl indeed*. She is decked out in her beft clothes, and crowned with flowers. She puts herfelf in a praying attitude; and as the priefts are inclined, the ferpent comes out, makes circles round the young fuppliant, and goes and repofes on her. The virgin, accompanied by a vaft multitude, carries him in triumph amidft the general acclamation. No human reafoning would perfuade thefe ignorant and credulous Egyptians that they are the dupes of a few impoftors: they believe in the ferpent Haridi as firmly as in the prophet."

ACHONRY, a fmall town of Ireland, in the province of Connaught and county of Sligo, feated on the river Shannon.

ACHOR, a valley of Jericho, lying along the river Jordon, not far from Gilgal; fo called from Achan, the troubler of Ifrael, being there ftoned to death.

Achor, in medicine, a fpecies of Herpes.

Achor, in mythology, the god of flies; to whom, according to Pliny, the inhabitants of Cyrene facrificed, in order to obtain deliverance from the infects and the diforders occafioned by them.

ACHRADINA (anc. geog.), one of the four cities or divifions of Syracufe, and the ftrongeft, largeft, and moft beautiful part of it; feparated by a very ftrong wall from the outer town, *Tycha* and *Neapolis*. It was adorned with a very large forum, with beautiful porticos, a moft elegant prytaneum, a fpacious fenatehoufe, and a fuperb temple of Jupiter Olympius.

ACHRAS, or Sapota Plum: a genus of the monogynia order, belonging to the hexandria clafs of plants; and ranking in the 43d Natural Order, *Dumofæ*.

The characters are: The *calyx* is a perianthium, confifting of fix ovate concave erect leaflets, the exterior ones broader and fhorter, the interior ones coloured. The *corolla* is compofed of one ovate petal, the height of the calyx; the border divided into fix

fegments.

segments. The *stamina* have six short subulated filaments at the throat of the corolla; and the antheræ are acute. The *pistillium* has a roundish depressed germen; the stylus is subulated, and longer than the corolla; the stigma is obtuse. The *pericarpium* is a globular twelve-celled pomum, with very soft flesh. The seeds are solitary, ovate, and glossy.

There are four species, all natives of the West Indies. The principal are, 1. The sapota, with oblong oval leaves, and smooth turbinated fruit. 2. The mammosa, with spear-shaped leaves, and large oval fruit. The first is common about Panama, and some places in the Spanish West Indies; but is not to be found in any of the British settlements in America. The second sort is very common in Jamaica, Barbadoes, and most of the West India islands, where the trees are planted in the gardens for their fruit, which is by many persons greatly esteemed. They grow to the height of 35 or 40 feet, having a straight trunk covered with an ash-coloured bark. The branches are produced on every side, forming a regular head; and are beset with leaves near a foot long, and almost three inches broad in the middle. The flowers are of a cream colour: and are succeeded by large oval fruit covered by a brownish skin, inclosing a thick pulp of a russet colour, very luscious, and called *natural marmalade*, from its resemblance to that of quinces. The stones taken in emulsion are reckoned good against the gravel.—These trees being natives of very hot climates, cannot be preserved in this country except in the warmest stoves.

ACHROMATIC, an epithet expressing want of colour. The word is Greek, being compounded of α, privative, and χρωμα, *colour*.

Achromatic Telescopes, are telescopes contrived to remedy the aberrations in colours; see Aberration.—A particular account of the invention and construction of these instruments will be found under Optics.

ACHTELING, a measure for liquids used in Germany. Thirty-two *achtelings* make a *heemer;* four *sciltims* or *sciltins*, make an *achteling*.

ACHYR, a strong town and castle of the Ukrain, subject to the Russians since 1667. It stands on the river Uorsklo near the frontiers of Russia, 127 miles W. of Kiow, Long. 36. 0. Lat. 49. 32.

ACHYRANTHES, in botany, a genus of the pentandria order, belonging to the monogynia class of plants, and associating with the *Miscellaneæ*, in the 54th Natural Order.

The characters are: The *calyx* is a double perianthium; the exterior one consisting of three lanced acute leaves, which are persistent; the interior of five leaves, also persistent. No *corolla:* The nectarium is five-valved, surrounding the germen, bearded at the top, concave, and falling off. The *stamina* consist of five filaments the length of the corolla, the antheræ are ovate and incumbent. The *pistillum* has a top-shaped germen; the stylus is filiform, and the length of the stamina; the stigma is villous, and divided into two segments. The *perianthium* is a roundish one-celled capsule, not gaping. The *seed* is single and oblong.

Of this genus eight species are enumerated; but the character of the genus does not agree in them all.

The species are all natives of the Indies. Only one of them, the amaranthus, is commonly cultivated in botanical gardens, and that more for the sake of variety than beauty. It grows to the height of three feet, with oblong pointed leaves. The flowers come out in long spikes from the extremities of the branches, and appear in July, the seeds ripening in September. Plants of this kind must be reared in a hot-bed, and may be transplanted when they have acquired sufficient strength. If kept in pots, and sheltered during the winter in a warm green-house, they will live two or three years.

ACICANTHERA, in botany, the trivial name of a species of Rhexia.

ACICULÆ, the small pikes or prickles of the hedge-hog, echinus-marinus, &c.

ACIDALIUS (Valens) would, in all probability, have been one of the greatest critics in these latter ages, had he lived longer to perfect those talents which nature had given him. He was born at Witstock, in Brandenburg; and having visited several academies in Germany, Italy, and other countries, where he was greatly esteemed, he afterwards took up his residence at Breslaw, the metropolis of Silesia. Here he remained a considerable time, in expectation of some employment; but nothing offering, he turned Roman-catholic, and was chosen rector of a school at Niessa. It is related, that about four months after, as he was following a procession of the host, he was seized with a sudden phrenzy; and being carried home, expired in a very short time. But Thuanus tells us, that his excessive application to study was the occasion of his untimely death; and that his sitting up a-nights in composing his Conjectures on Plautus, brought upon him a distemper which carried him off in three days, on the 25th of May 1595, being just turned of 28. He wrote a Commentary on Quintus Curtius; also, Notes on Tacitus, on the Twelve Panegyrics; besides speeches, letters, and poems. His poetical pieces are inserted in the *Deliciæ* of the German poets, and consist of epic verses, odes, and epigrams. A little piece, printed in 1595, under the title of *Mulieres non esse homines*, "That women were not of the human species," was falsely ascribed to him. But the fact was, that Acidalius happening to meet with the manuscript, and thinking it very whimsical, transcribed it, and gave it to the bookseller, who printed it. The performance was highly exclaimed against, insomuch that the bookseller being seized, he discovered the person who gave him the manuscript, and a terrible outcry was made against Acidalius. A story goes, that being one day to dine at a friend's house, there happened to be several ladies at table; who supposing him to be the author, were moved with so much indignation, that they threatened to throw their plates at his head. Acidalius, however, ingeniously diverted their wrath. In his opinion, he said, the author was a judicious person, the ladies being certainly more of the species of *angels* than of *men*.—Mr Baillet has given him a place among his *Enfans Celebres;* and says, that he wrote a comment upon Plautus when he was but 17 or 18 years old, and that he composed several Latin poems at the same age.

ACIDALUS, a fountain in Orchomenus, a city of Bœotia, in which the Graces, who are sacred to Venus, bathed. Hence the epithet *Acidalia*, given to Venus, (Virgil.)

ACIDITY, that quality which renders bodies acid.

Acidoton, Acids.

ACIDOTON, in botany, the trivial name of a ſpecies of ADELIA.

ACIDS, in chemiſtry, the name by which one of the general claſſes of ſalts are diſtinguiſhed. The characteriſtic marks of them are, 1. The peculiar taſte which we call ſour; though this does not hold univerſally: for the acid of arſenic, which in other reſpects manifeſts a ſtrong acid power, has not this ſour taſte; nor are the volatile ſulphureous acid, or thoſe of *tungſten* and *molybdæna*, lately diſcovered by Mr Scheele, very diſtinguiſhable in this way. On the other hand, the ſtrong acids of vitriol, nitre, and even ſea-ſalt, are altogether cauſtic, and cannot be taſted until they have been largely diluted with water. 2. With water they combine into a fluid, the ſpecific gravity of which is not a medium betwixt the water and acid ſeparately taken. This holds good with the ſtrong acids, which grow hot with water, and ſhrink into leſs bulk by reaſon of their emitting a quantity of the fire they contain: but whether it alſo takes place in the weaker acids, has not yet been aſcertained; though the probability is, that it will take place in them alſo. 3. With ſpirit of wine, they unite into a very volatile and inflammable ſubſtance called *ether*. This alſo muſt be underſtood only of the ſtrong mineral acids, or of the acetous when very much concentrated; for the acids of tartar, borax, arſenic, lapis ponderoſus (*tungſten*), and molybdæna, do not produce any. 4. They change the blue colour of vegetables to red, and heighten the colour of thoſe which are already red.—This property is more univerſal than thoſe we have yet mentioned; but the volatile ſulphureous acid, thoſe of tungſten and molybdæna, are exceptions. 5. They unite with all kinds of earths excepting the ſiliceous (though the fluor acid diſſolves this alſo), with fixed and volatile alkalies, and with metals, in ſuch a manner as to form compounds conſiderably permanent, and whoſe ingredients cannot be ſeparated without ſome difficulty. This is the moſt univerſal and diſtinguiſhing mark; and there is not any acid but what ſhows its attraction for one or other of theſe ſubſtances, eſpecially the alkaline ſalts. Oils and fats, indeed, will unite with alkalies; but they may be ſeparated by the weakeſt known acids, ſo that there is no danger of confounding the two together. 6. When mixed with any fermentable liquor, they prevent that proceſs from taking place; or, if it has already begun, they will put a ſtop to it. This alſo muſt be underſtood only of the ſtronger acids, or at leaſt will require a conſiderable quantity of the weaker to effect it. 7. They cannot be frozen but in a degree of cold below the freezing point of water. This property is likewiſe not univerſal, but is remarkable only in the ſtronger acids.

1 General properties of acids.

2 Of the nature of acids.

The nature of acids has long been a matter of ſpeculation, and of late has engaged the attention of philoſophers very conſiderably. Some have ſuppoſed them to be ſimple chemical elements, while others imagined them to be compoſed of water and earth. Both theſe opinions, however, are inadmiſſible; the former, becauſe we are certain that moſt acids may be entirely decompoſed, and reſolved into aerial vapours of different kinds, which could not happen if they were ſimple and unchangeable elements; the latter, becauſe there is not the ſmalleſt probability that two ingredients, ſeemingly ſo inſipid and inactive as water and earth, could by their union produce a compound endowed with ſuch powerful and even deſtructive properties as many of the acids poſſeſs.——The late diſcoveries concerning air of different kinds have ſuggeſted a new theory, firſt publiſhed by M. Lavoiſier, and ſtrenuouſly maintained by the French chemiſts, *viz.* That the acid principle is contained in the air; and, according as it combines itſelf with different ſubſtances, forms acids of different denominations.

3 Mr Lavoiſier's hypotheſis that air is the acid principle.

This theory he conſiders as eſtabliſhed by numerous indiſputable experiments. Theſe cannot here be detailed; but his concluſions from the whole are, That "*dephlogiſticated air* enters as a conſtituent part into the compoſition of ſeveral acids, particularly the phoſphoric, vitriolic, and nitrous; that this pure and highly reſpirable air is the conſtitutive principle of acidity common to all acids; and that the difference by which they are diſtinguiſhed from each other is produced by the union of one or more principles beſides this air, ſo as to conſtitute the particular form under which each acid appears." To dephlogiſticated air in its ſtate of fixity, therefore, he gives the title of the *acidifying* or *oxygenous* principle; and concludes farther from his experiments, 1. "That, when combined with the matter of fire, heat, and light, this principle produces dephlogiſticated air; though he conſiders this poſition as not capable of abſolute demonſtration. It muſt not, therefore, be confounded with the following; which, he ſays, are ſupported by experiment and poſitive proofs. 2. That the ſame acidiſying principle, combined with phlogiſtic ſubſtances or charcoal, forms fixed air. 3. That with ſulphur it forms vitriolic acid. 4. That with nitrous air it forms nitrous acid. 5. That with Kunckel's phoſphorus, it forms the phoſphoric acid. 6. With ſugar it forms the acid of ſugar," &c.

4 Baſis of dephlogiſticated air ſuppoſed to be the acid principle.

5 Mr Kirwan's opinions.

The opinion of Mr Lavoiſier concerning the compoſition of acids has in part been adopted by Mr Kirwan; who, in his treatiſe on Phlogiſton, publiſhed in 1787, informs us, that he is now of opinion "that dephlogiſticated air becomes an eſſential conſtituent part of acids. All acids (he adds) conſiſt of two principles: one peculiar to each, which, in the opinion of the antiphlogiſtians, has not as yet been decompoſed, and conſequently muſt be looked upon, relatively to the preſent ſtate of our knowledge, as a ſimple ſubſtance: the other, *pure air*, in a concrete ſtate; that is, deprived of the greater part of its ſpecific heat, and condenſed into a ſmaller volume. The firſt they call the *acid baſis*; the laſt, the *oxygenous* principle: thus the vitriolic acid, according to them, conſiſts of ſulphur as its baſis, and pure air in a concrete ſtate as its acidifying or oxygenous principle. This doctrine of the compoſition of acids has been admitted by ſome of the ableſt defenders of phlogiſton, and particularly by that diſtinguiſhed philoſophic chemiſt M. de Morveau, with this ſingle modification, that the baſes of acids contain phlogiſton, which they loſe on uniting to pure air: yet it ſeems very difficult to conceive how pure air can unite to phlogiſton, a ſubſtance to which it has the greateſt affinity, without forming a new compound endowed with very different properties from thoſe which it poſſeſſed before ſuch union. It ſeems therefore more reaſonable to conclude, either that it forms water, as Mr Cavendiſh thinks; or fixed air, as I ſhall afterwards endeavour to prove."

In his explanation of the formation of acids, Mr Kirwan

Acids.

Kirwan first states the opinion of the antiphlogistians, viz. That the vitriolic acid, when considered abstractedly from the water it contains, always consists of sulphur (which they consider as a simple substance) united to a large portion of the oxygenous principle. "In my opinion (says he), it consists of a basis or radical principle, which, when saturated with phlogiston, constitutes sulphur; when saturated with fixed air, becomes common fixed vitriolic acid; and, when combined partly with the one and partly with the other, becomes volatile vitriolic acid. That sulphur, during its conversion into vitriolic acid, unites to air of some sort or other, is evident from the quantity of air which it absorbs, in whatever way that conversion is brought about. Thus, first, during combustion in respirable air, 100 grains of sulphur absorb 420 cubic inches of pure air, or about 143 grains: but the proportion of this pure air united with a given quantity of sulphur is not easily determined, because it is vitriolic air that is constantly formed; and this air essentially contains some portion of sulphur in solution, which portion is variable. Secondly, Pyrites, during their decomposition, absorb a considerable proportion of pure air, as Mr Lavoisier has observed; so also does liver of sulphur exposed to the atmosphere, for after some time it is converted into tartar vitriolate."

6 Whether pure air absorbed in the burning of sulphur continues to be so.

Mr Kirwan next proceeds to inquire, whether the air absorbed during the combustion of sulphur continues to be pure air; or whether it be converted into water or fixed air? He inclines to the latter opiuions, for various reasons* which he specifies.

* Essay, p. 29.

7 Formation of the nitrous acid.

With regard to the nitrous acid, the experiments of Mr Cavendish, as well as of the French chemists, leave no room to doubt that it is produced during the deflagration of dephlogisticated and inflammable air. Mr Cavendish has shown that the nitrous acid may be formed by taking the electric spark in a mixture of three measures of phlogisticated air and seven of dephlogisticated air, or, in weight, one part of the former and about 2.6 of the latter. Mr Lavoisier, as has been already mentioned, supposes the nitrous acid to be composed of nitrous air united to the oxygenous principle, or basis of pure air; and 100 grains of dry nitrous acid consist of 64 grains of nitrous air united to 36 of pure air deprived of its specific fire; or, according to Mr Kirwan's calculation, 173 cubic inches of nitrous air and 105 of pure air. But nitrous air, as Mr Lavoisier himself has observed, is a compound; 100 grains of it, according to him, containing 32 of phlogisticated and 68 of pure air; consequently 64 grains of it contain 20.5 of phlogisticated air, and 43.5 of pure air. Hence, according to him, 100 grains of dry nitrous acid contain $79\frac{1}{2}$ of pure air and $20\frac{1}{2}$ of phlogisticated air.

8 Proportion of its constituent parts.

Mr Kirwan is of opinion that 100 grains of pure, dry, and colourless nitrous acid contain 38.17 grains of fixed air as its acidifying principle, 57.06 of nitrous basis, and 4.77 of phlogiston united to the nitrous basis. With regard to the nitrous basis itself, he says that one third of its weight is phlogisticated and two thirds dephlogisticated air, both in a concrete state.

"Nitrous basis (says Mr Kirwan), saturated with phlogiston, constitutes nitrous air: 100 grains of this basis take up nearly 22 of phlogiston. Hence the constituent principles of nitrous acid are fixed air, dephlogisticated air, phlogisticated air, and inflammable air, all in their concrete state.

"Red, yellow, green, and blue nitrous acids, when those colours are intense, owe their origin to the absorption of nitrous air; and consequently the proportion of their principles is variable, though all have the dephlogisticated acid for their ground. Thus Dr Priestley, having exposed strong pale-yellow nitrous acid, whose specific gravity could not be less than 1.400 to nitrous air, found that 100 grains of this acid absorbed, in two days, 247 cubic inches of nitrous air: now, 100 grains of this spirit must have contained, by my calculation, about 21 grains of dry acid, and these 21 grains took up 91.39 grains of nitrous air. When about 20 cubic inches of nitrous air were absorbed (that is, about seven grains), the acid became of an orange colour; when 50 cubic inches were absorbed (about 18 grains), it became green; and when nearly the whole was absorbed, it evaporated in the form of nitrous vapour, carrying off part of the water with it. Hence we see, that nitrous vapour consists of nitrous acid united to three or four times its weight of nitrous air and a little water."

9 Mr Lavoisier's theory contested.

Mr Kirwan next proceeds to contest Mr Lavoisier's opinion, that nitrous air is a constituent principle of the nitrous acid. "The following experiments (says he) show that nitrous air is not a constituent principle of the nitrous acid, but that fixed air is. 1. There is not a doubt but that pure nitrous acid enters entire, and without decomposition, into fixed alkalis, and forms nitre. Now if nitre be distilled in a good earthen retort, it will be wholly decomposed; and so also will the acid itself, except a few drops which pass in the beginning of the distillation, and nothing but dephlogisticated air, more or less pure, and consequently intermixed with phlogisticated air and a slight proportion of fixed air, will be found: these, therefore, are its true constituent parts when disengaged from substances that cannot communicate phlogiston to it in any remarkable quantity, such as alkalis and earths; but if it be separated from substances that contain phlogiston, such as metals, it will then indeed be resolved into nitrous air, and dephlogisticated air more or less pure, the phlogiston of the fixed air being detained by the metal. Mr Berthollet, who seems to have made the experiment with the greatest exactness, produced 714 cubic inches of dephlogisticated air from a Troy ounce of nitre. This, however, was far from being of the purest kind; and Dr Priestley, Mr Berthollet, and Mr Succow, observed, that the air which first passes contains fixed air, and renders lime-water turbid. Here then we have three of the constituent parts of the nitrous acid, with scarce any nitrous air; which the antiphlogistians suppose to be one of the constituent parts of the acid, and to make two thirds of its bulk when exhibited in an aerial form."

To obviate an objection that the quantity of fixed air thus obtained is too small to deserve to be ranked among the constituent parts of the nitrous acid, Mr Kirwan first inquires in what proportion it ought to exist there; and though this is variable, according to the different states of the nitrous acid with respect to phlogistication, he reckons it at one-third of the acid as existing in the nitre; and, from the decomposition of this

this fixed air, and the phlogiſton emitted by it of conſequence, he attributes the phlogiſtication and redneſs of the nitrous acid when expoſed to more heat. As a proof that fixed air may be decompoſed in this manner, he adduces two experiments of Dr Prieſtley. In one of theſe, dephlogiſticated air was obtained by means of acetous acid in that concentrated ſtate in which it is called *radical vinegar*. Having mixed half an ounce of the acid with two ounces of calcined whiting, he obtained from it 350 ounce-meaſures of air; of which about one-third was fixed more in the firſt portions, and leſs in the laſt. The ſtandard of the reſiduum in the firſt portions was, 1.66, in the ſecond, 1.42, and in the third, 1.38; which is very near the goodneſs of common air. The whiting then weighed 760 grains. On adding a quarter of an ounce more of radical vinegar, and repeating the operation, 120 ounce-meaſures of air were obtained, and the whiting was reduced to 730 grains. A third operation, in which another quarter of an ounce of vinegar was added, reduced the matter to 489 grains; but the laſt portion of air extracted had no fixed air, and was conſiderably better than that of the atmoſphere.——The other experiment was made with lime-ſtone alone; from four ounces of the *white cryſtals*, of which 830 ounce-meaſures of air were obtained, the firſt portion of which had only one-fourth of fixed air, and the ſtandard of the reſiduum was never better than 1.56, nor worſe than 1.66; ſo that it was nearly of the goodneſs of common air.

Our author then proceeds to relate ſeveral other experiments in which the nitrous acid was decompoſed; but a particular relation of them would ſwell this article beyond its due bounds. At laſt, however, he concludes in the following manner. "If ſpirit of nitre be made to boil, and its vapour received through a red-hot earthen tube, it will be converted into dephlogiſticated air, in which a portion both of phlogiſticated and fixed air is found, as Dr Prieſtley has diſcovered: the water through which this air paſſes will alſo contain fixed air. Here then are ſeveral ways of decompoſing the nitrous acid; and in one only it is reſolved into nitrous and dephlogiſticated air; and in this way it may, at leaſt, be ſtrongly ſuſpected to receive an addition of another principle. Why then ſhould

10
Fixed air one of the elements of nitrous acid.

theſe be regarded as its conſtituent principles? And as in the two ſimpleſt methods of decompoſition, in which the reaction of no foreign ſubſtance can be ſuſpected, it appears in the form of dephlogiſticated, phlogiſticated, and fixed air (the former always containing a portion of the two laſt), why then ſhould not theſe be accounted its true conſtituent parts?——This theory

11
How nitrous acid is naturally generated.

is further confirmed by reflecting on the manner in which nitrous acid is generated by nature. Mr Thouvenel found that this acid is conſtantly produced when chalk is expoſed to a mixture of putrid air and common air, or putrid and dephlogiſticated air; but if the putrid air be paſſed through lime-water, it is never generated; and that it is rarely produced by the expoſure of quick-lime or fixed alkalis to theſe airs. The reaſon that alkalis, though aërated, are not ſo proper, is, that they do not combine with phlogiſticated air as calcareous earths do. Mr Cavendiſh, indeed, produced nitrous acid without any apparent mixture of fixed air; but the atom of it neceſſary for the formation of the ſmall quantity of nitrous acid he produced (about one-third of a grain), might well be contained in the phlogiſticated air he employed, or perhaps formed in the operation."

12
Experiments by Mr Watt, which ſeem contrary to Mr Kirwan's doctrine.

Having thus far ſtated the different opinions of the moſt celebrated French and Engliſh philoſophers concerning the compoſition of acids, it is neceſſary to take notice of ſome experiments made by Mr Watt, in order to determine whether the dephlogiſticated air produced from nitre really proceeds from a decompoſition of the acid, or what quantity of the latter is required to conſtitute a determinate quantity of the former. To aſcertain this *, 240 grains of mercury were put into a glaſs retort with 480 grains of diluted dephlogiſticated nitrous acid, which was the quantity neceſſary to diſſolve the whole of the mercury; and as ſoon as the common air was expelled, a proper veſſel was applied to receive the air produced in the operation. Sixteen ounce-meaſures of nitrous air came over during the ſolution, and on changing the receiver, a quantity of dilute, but highly phlogiſticated nitrous acid, was obtained. The air receiver being again applied, four ounce meaſures of ſtrong and pure nitrous air were obtained, which, by the dephlogiſticated air that aroſe immediately after, were reduced to half an ounce meaſure. The production of dephlogiſticated air continued very rapid, the mercury being all the while received, until the operation was ended by the diſtillation or ſublimation of the whole of the mercury. Two hundred and eighteen grains of the metal were obtained in its running form, and 22 remained in the form of an orange-coloured ſublimate in the upper part of the retort.—The 16 ounce-meaſures of nitrous air, firſt obtained, were then converted into nitrous acid by the gradual admiſſion of common air, and then added to the water in the baſon in which the receiver had been inverted; the whole quantity being about two quarts, and very acid to the taſte, ſparkling at the ſame time with nitrous air. To determine the quantity of acid thus recovered, as well as that which remained in the ſublimate, a ſolution of alkali of tartar was made; and by experiment it was found, that 120 grains of the acid, originally employed in diſſolving the mercury, ſaturated 352 grains of this ſolution; the orange coloured ſublimate and all the acid liquor recovered being ſaturated by 1395 grains of the ſame. Hence it appears, by the rule of proportion, that out of 480 grains of nitrous acid originally employed, only five were loſt; "a ſmaller quantity (as Mr Watt juſtly obſerves) than what might reaſonably be ſuppoſed to be loſt in the proceſs by the extreme volatility of the nitrous acid." His concluſion therefore is, that "the nitrous acid does not enter into the compoſition of dephlogiſticated air: it ſeems only to ſerve to abſorb phlogiſton from the watery part of the mercurial nitre."

* Philoſ. Tranſ. v. lxxiv. p. 339.

This experiment was repeated with cubic nitre, and only 30 ounce-meaſures of air diſtilled from an ounce of the mineral alkali exactly ſaturated with nitrous acid. The water through which the air paſſed was acid, and the reſiduum in the retort alkaline; but on mixing the two together, the ſolution was found to be exactly neutral by every poſſible teſt.

Not ſatisfied with theſe experiments, Mr Watt diſtilled an ounce (480 grains) of common nitre, ſtopping the proceſs when 50 ounce-meaſures of air had been produced. This air had a ſtrong ſmell of the nitrous

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nitrous acid, from which it could not be freed by washing with the water in the bason. The residuum in the retort was alkaline as before, and the water slightly acid; nor was the saturation completed by mixing the two together. Ten grains of weak nitrous acid, 105 grains of which contained the acid of 60 of nitre, completed the saturation. These ten grains contained the acid of 57 grains of nitre; which, by Mr Kirwan's experiments, is equal to two grains of real nitrous acid. "We have therefore (says Mr Watt) 34 grains weight of dephlogisticated air produced, and only two grains of real acid missing; and it is not certain that even this quantity was destroyed, because some portion of the glass of the retort was dissolved by the nitre, and some part of the materials employed in making the glass being alkali, we may conclude, that the alkali of the nitre would be augmented by the alkali of that part of the glass it had dissolved; but as the glass cracked into small pieces on cooling, and some part of the coating adhered firmly to it, the quantity of the glass that was dissolved could not be ascertained."

13
Answered by Mr Kirwan.

To avoid the force of objections drawn from these experiments, and which seem ready to overthrow his hypothesis, as well as that of Mr Lavoisier entirely, Mr Kirwan makes the following reply.——"My ingenious friend Mr Watt, as well as Mr Cavendish, are of opinion, that the whole quantity of dephlogisticated air, produced from the distillation of nitre, arises from the dephlogistication of the water it contains, it being decomposed by the nitrous acid, which then becomes phlogisticated. This opinion is exposed to insurmountable difficulties. For, in the first place, nitre affords dephlogisticated air at the rate of 146.125 cubic inches for every 100 grains of nitre, which, by the proper allowances for phlogisticated air, should weigh 46.77 grains: but then dephlogisticated air is only one of the constituent parts of water, for it contains 13 *per cent.* of inflammable air, that is to say, 87 grains of dephlogisticated air: to form 100 grains of water requires an addition of 13 grains of inflammable air; consequently 46.77 grains of dephlogisticated air require nearly 7 of inflammable air, and would then form 53.77 grains of water, which exceeds half the weight of the nitre; a quantity of water, as Mr Watt owns, certainly inadmissible.—Mr Watt found, that the water over which the air proceeding from the decomposition of 960 grains of nitre had been received, contained only the acid belonging to 120 grains of nitre; and even this small quantity he inferred only from my experiments. But my experiments are totally inapplicable in this case; for I used only the dephlogisticated nitrous acid: and alkalis are saturable by a much smaller quantity of phlogisticated than of dephlogisticated acids, as is evident in the case of the *dephlogisticated marine* acid, as Stahl long ago observed; for he says, that the volatile acid of sulphur saturates 10 times as much alkali as the fixed. Mr Bergman and Mr Scheele observed, that melted nitre is still neutral, though it be phlogisticated; therefore it is air, and not water, which it wants. Accordingly Dr Priestley found it to injure common air by attracting its dephlogisticated part: but if it be kept in fusion for some time, it loses its acid, and becomes alkaline; and the air it receives must surely be deemed rather to recompose the acid than to form water; of whose formation, in the temperature of the atmosphere, we have no sort of proof. On the contrary, the impossibility of accounting for the loss of acid in this case is an evident proof of the fallacy of that hypothesis. —By Mr Lavoisier's analysis, 100 grains of nitre contain 57 of caustic alkali; by Mr Bergman's, 49; by Mr Wenzel's, 52; by Mr Wiegleb's, 46½; by mine, 63: the mean of all which is, 53½; which leaves 46.5 for acid and water, which is very nearly the weight of the air expelled. The different quantity of acid assigned by different persons to nitre, is in part owing to its degree of phlogistication in nitre. I believe at present, that 100 grains of nitre contain 34 of acid and about 12 of water, including the water in the acid and that of crystallization."

14
Quantity of acid contained in nitre.

15
Principles of the marine acid.

Mr Kirwan next proceeds to consider, in a manner similar to that above related, the composition of the other acids.—The marine acid, according to him, consists of a peculiar basis united to phlogiston, and a certain quantity of fixed air; to both of which the basis seems to have a strong affinity. On depriving it of this phlogiston, the affinity of the acid to fixed air becomes much stronger, and it saturates itself so largely with it, that its attractions for other substances, containing little or no phlogiston, become nearly as weak as those of fixed air itself when equally condensed; but with respect to bodies that contain a considerable quantity of phlogiston, its affinities are much stronger, as its basis attracts the phlogiston, while those bodies attract its excess of fixed air. In this state it does not expel fixed air from aërated fixed alkalis or earths until it is heated; and then dephlogisticated air separates from it, and it becomes, in all respects, common marine acid. For as it contains an excess of fixed air, it acts nearly as an acid of the same nature; but when heat is applied, its basis dephlogisticates its own fixed air, which then becomes dephlogisticated air, at the same time that the acid becomes common marine acid, and acts as such.

16
Mr Lavoisier's opinion.

Mr Lavoisier, and other philosophers, who deny the existence of phlogiston, are of opinion, that the common marine acid consists of a peculiar basis united to a small proportion of pure air, or oxygenous principle, and the dephlogisticated marine acid differs from it only by containing an excess of this principle.—This opinion they are chiefly induced to maintain, because the acid in its dephlogisticated state is procured by distilling common marine acid from manganese; and the manganese, if distilled by itself, before the acid is distilled from it, affords dephlogisticated air; but after the acid is distilled from it, it yields none.—"This experiment, however, (says Mr Kirwan), proves no more but that the manganese contains some air which is dephlogisticated during the calcination. And that this air is fixed air, appears from the following considerations: The black calx of manganese almost always gives out fixed air at first, before any dephlogisticated air appears; whence it is natural to think, that the dephlogisticated air proceeds from the dephlogistication of the fixed. And hence, if it be distilled with filings of iron, or in a gun-barrel, it scarce gives out any other than fixed air; if at any time it gives out dephlogisticated air, with little or no mixture of fixed air, this is owing to a very perfect dephlogistication of the calx, and to its containing very little moisture. Thus Dr Priestley, having

17
Contested by Mr Kirwan.

having paſſed the ſteam of boiling water through manganeſe heated in an earthen tube, obtained a very large quantity of fixed air, and ſcarce any other; though on repeating this experiment with manganeſe well freed from calcareous earth, I obtained a large portion of dephlogiſticated air; but I believe much depends on the degree of heat to which the tube is ſubjected. But having diſtilled manganeſe, which yielded of itſelf ſome fixed air with common ſpirit of ſalt, I obtained dephlogiſticated marine acid, and not a particle of fixed air; which ſhows that this laſt combined with the dephlogiſticated baſis, and formed the dephlogiſticated acid. Mr Hermſtadt having diſſolved the black calx in common marine acid, and precipitated it with an aërated fixed alkali, obtained, as uſual, a white precipitate; which, when heated, afforded a great part of the fixed air it had abſorbed from the alkali; but when heated to ſuch a degree as to be of a brown red colour, and conſequently dephlogiſticated, it converted common ſpirit of ſalt into a dephlogiſticated acid, which could proceed only from ſome fixed air yet unexpelled: Yet if ſal-ammoniac be diſtilled with the black calx of manganeſe, it will be expelled in a cauſtic ſtate; for the fixed air unites to the dephlogiſticated marine baſis in preference to the volatile alkali."

18 Deciſive experiment in his favour.

Several other experiments are related by Mr Kirwan, which the limits of this article will not allow us to inſert; but the following, he is of opinion, fully confirms his hypotheſis, and ſubverts that of the antiphlogiſtians. "Six cubic inches of inflammable air were mixed with as much dephlogiſticated marine air over lime-water. In about 10 minutes after the greater part of the diminution had taken place, a white cloud appeared on the ſurface (*a*) of the lime-water, and by agitation it became ſtill more turbid. As it was poſſible that the manganeſe might be mixed with calcareous earth, ſome dephlogiſticated marine air was extracted from another portion of it, and received on lime-water; but it was wholly abſorbed, without forming the leaſt cloud, tho' there was lime enough; for, on adding aërated water, a cloud appeared."

19 Phoſphoric acid.

The other acids particularly treated of by Mr Kirwan are the phoſphoric and ſaccharine. In his treatiſe on the former, he adopts the analyſis of Mr Lavoiſier, changing only his acid principle of dephlogiſticated for fixed air. From this it appears, that the phoſphoric acid conſiſts of a peculiar baſis united to 2.265 of its weight of the acid principle; or, in other words, 100 grains of dry phoſphoric acid contains about 69 of fixed air and 31 of its peculiar baſis: 100 grains of the phoſphoric baſis take up 226.5 of fixed air, or 32.9 of phlogiſton when it becomes phoſphorus; and 100 grains of phoſphorus contain 75.24 of baſis and 24.76 of phlogiſton.—The baſis of this acid is the only one that can be procured free, both from the phlogiſton and the acidifying principle; it is called, though improperly, as it is not ſoluble in water, the *glacial phoſphoric* acid. Mr Lavoiſier and others are of opinion, that phoſphorus is a ſimple ſubſtance containing no phlogiſton, and that the acid conſiſts of the oxygenous principle united to it.

20 Saccharine acid.

With regard to the acid of ſugar, Mr Kirwan obſerves, that ſugar itſelf is a compound of fixed air with a much larger proportion of inflammable air, and ſome water, all condenſed to a degree of which we are ignorant, but retaining, upon the whole, much more ſpecific heat than either oil or charcoal; though he ſeems inclined to the hypotheſis of Mr Morveau, that this ſubſtance has for its baſis a fine ethereal oil, to which a large proportion of condenſed inflammable air is ſuperadded. The acid of ſugar, then, according to him, conſiſts of this peculiar baſis deprived of its ſuperfluous phlogiſton, and united to a great quantity of fixed air in a concrete ſtate. He is alſo of opinion, that it does not exiſt ready formed in the ſugar, but is produced in the operations that ſubſtance undergoes: that it derives moſt of its acid principle from the nitrous acid employed; the nitrous baſis taking up the phlogiſton, and the fixed air of the nitrous acid combining with the ſaccharine baſis. He conteſts ſtrongly an opinion of Mr Lavoiſier, that ſugar is a ſort of *charcoal*, which, uniting with the oxygenous principle of the nitrous acid, decompoſes it, ſets looſe the nitrous air, and forms the ſaccharine acid; and that, towards the end of the operation, the ſaccharine acid itſelf is decompoſed; the conſequence of which is the production of fixed air, which, according to him, is only the oxygenous principle combined with charcoal. On this Mr Kirwan remarks, 1. "That, according to this theory, the acid of ſugar ſhould be the ſame with fixed air, ſince both are compoſed of the oxygenous principle united with charcoal: or, if Mr Lavoiſier ſhould reply, that ſugar is different from common charcoal, he reminds him, that, according to his own table of affinities, the oxygenous principle has a much ſtronger attraction for charcoal than for ſugar, and conſequently that the latter ought to be decompoſed by the former; nay, that it ſhould be regenerated by various metallic ſubſtances, which, according to him, have a greater attraction for this principle. 2. According to this hypotheſis, the ſaccharine acid ought to weigh more than the ſugar employed in the operation; which is ſo far from being the caſe, that it is univerſally agreed to be much leſs; Bergman making it only $\frac{1}{3}$d, Mr Chaptal from $\frac{1}{3}$d to $\frac{2}{5}$ths, and Mr Sage $\frac{10}{16}$ths. 3. If the ſaccharine acid conſiſted of ſugar, or conſiſted of that ſubſtance undecompoſed, and barely united to the oxygenous principle, it ought to be formed by treating ſugar with the black calx of manganeſe, or with dephlogiſticated marine acid; both of which, according to him, have leſs attraction for the oxygenous principle than ſugar. Laſtly, (ſays Mr Kirwan), If the acid of ſugar be diſtilled, it is wholly converted into water, fixed inflammable air, and not a particle of coal or dephlogiſticated air is found in it. It is not therefore reaſonable to look on either of them as its conſtituent principles; but as fixed air alone can be extracted from all vegetable acids, it ſeems to be the true acidifiable principle."

21 Fixed air the acid principle, according to Mr Kirwan.

Having given a view of the preſent opinions relative to the original formation of acids, it remains to treat a little more particularly of each of the different kinds.

(*a*) On mixing theſe, a denſe white cloud appears; one half the bulk of both diſappears, and the reſiduum explodes like a mixture of inflammable and dephlogiſticated air.

Acids.

kinds. They are divided into three different claſſes, expreſſive of their origin, *viz.* the Mineral, Vegetable, and Animal. The mineral acids are thoſe of vitriol, nitre, ſea-ſalt, borax, amber, fluor, arſenic, tungſten, molybdæna, &c. The vegetable are, thoſe of vinegar, tartar, ſugar, benzoin, apples, citrons, lemons, tamarinds, ſorrel, cork, &c. The animal acids are, the microſmic or acid of urine, and that of bones, both of which are alſo called the *phoſphoric*, though this might be accounted a vegetable acid, as it is procured by diſtilling muſtard and ſome other vegetables by a violent fire. Beſides theſe, there are the acids of ants, waſps, bees, ſilk-worms, milk, &c. It has alſo been diſcovered, that the human calculus is formed for the moſt part of a peculiar acid, which has received the name of *lithiaſic* acid. Laſtly, As an acid diſtinct from all theſe, we may now add *fixed air*, by ſome called the *aerial*, and by others the *cretaceous* acid; the latter appellation it derives from *creta*, chalk, becauſe it is found in that ſubſtance in great quantity. See Aerology.

22 Acids, how divided.

23 Enumeration.

24 General account of their attractions for alkalis, &c.

The general properties of acids have already been enumerated; the moſt remarkable of which is their attraction for alkaline ſalts, earths, and metals. Though this is common to all, yet very conſiderable differences are obſerved among them in this reſpect, and on thoſe differences depend almoſt all the phenomena of that part of Chemistry which treats of ſalts. As theſe phenomena are particularly conſidered under that article, we ſhall here only in general take notice, that the three acids named the *vitriolic*, *nitrous*, and *marine*, are the ſtrongeſt of them all; that is, if any other acid be united to an alkali, earth, or metal, the union will be broken by adding to that compound any of the three acids juſt mentioned. Neither are theſe equal in power among themſelves; for the vitriolic is ſtronger than the nitrous, and the nitrous ſtronger than the marine. The rule, however, is liable to certain exceptions and variations, depending chiefly on the circumſtances of heat or cold, moiſture or dryneſs, and particularly on the ſtate of the marine acid with regard to its being in the form of an aqueous fluid or reduced to a dry vapour. In this laſt caſe it ſeems ſtronger than either the vitriolic or nitrous; and even when in an aqueous ſtate, both the nitrous and marine acids, when added in great quantity, ſeem to oppreſs and overwhelm the ſtronger vitriolic acid, ſo that they will partly expel it from an alkaline ſalt. This does not depend on the mere quantity of acidity they poſſeſs: for the acetous acid may be concentrated to ſuch a degree as to become ſtronger in this reſpect than ſpirit of ſalt; yet it will always be inferior in point of real ſtrength, when tried with an alkali in competition with the latter. The aerial acid is the weakeſt of all; and may be expelled not only by vinegar, but by the acid juices of fruits, tartar, and the acids of tungſten and molybdæna.

Some acids have the property of reſiſting the fire, and melting into a kind of glaſs, ſuch as that of borax and phoſphorus. This circumſtance gives them an advantage over the ſtronger acids which are volatile; and thus the two juſt mentioned, as well as thoſe of arſenic and tungſten, will, in a very ſtrong heat, expel the acid of vitriol itſelf, though the latter will, in the cold, expel any one of them with great eaſe.

Both the vitriolic and nitrous acids have a very ſtrong attraction for phlogiſton; and unite with certain oily and inflammable matter ſo vehemently as to occaſion great heat, and ſometimes even violent and unextinguiſhable flame. This is particularly the caſe with the nitrous acid, or with a mixture of the two; and indeed the nitrous acid, though weaker than the vitriolic, ſhows itſelf in every inſtance to be far more active, and to perform all its operations with vaſtly greater rapidity, than the other. All theſe particulars, however, as they properly fall under the article Chemistry, are there explained at length: together with the origin and peculiar methods of preparing each of the acids, and the various uſes to which they may be applied in arts and manufactures. See alſo their different titles as they occur in the order of the alphabet; as, Nitre, Vinegar, Vitriol, &c.

Acidulous ‖ Acis.

ACIDULOUS denotes a thing that is ſlightly *acid*; it is ſynonymous with the word *ſub-acid*.

ACIDULÆ. Mineral waters that contain a briſk ſpirit, when unaccompanied with heat, are thus named; but if they are hot alſo they are called Thermae. See Mineral Waters.

ACIDULATED, a name given to medicines that have an acid in their compoſition.

ACIDUM aereum, the ſame with *Fixed Air.*

Acidum pingue, an imaginary acid, which ſome German chemiſts ſuppoſed to be contained in fire, and by combining with alkalis, lime, &c. to give them their cauſtic properties; an effect which is found certainly to depend on the loſs of their fixed air.

ACILA, Ocila, or Ocelis (anc. geog.), a ſtaple or mart town in Arabia Felix, on the Arabic gulf, from which, according to Pliny, they ſet ſail for India. Now *Ziden*.

ACILIUS GLABRIO (Marcus), conſul in the year of Rome 562, and 211 years before the Chriſtian æra, diſtinguiſhed himſelf by his bravery and conduct in gaining a complete victory over Antiochus the Great, king of Syria, at the ſtreights of Thermopylæ in Theſſaly, and on ſeveral other occaſions. He built the Temple of Piety at Rome, in conſequence of a vow he made before the above mentioned battle: and the reaſon of his giving it that name is very remarkable. The ſtory is mentioned by Pliny, Valerius Maximus, and others. See the article Piety.

ACINIPPO (anc. geog.), a town of Bætica; its ruins, called *Ronda la Viega*, are to be ſeen near Arunda, in the kingdom of Granada.

ACINODENDRUM, in botany, the trivial name of a ſpecies of Melastoma.

ACINOS, in botany, the trivial name of a ſpecies of Thymus.

ACINUS, or Acini, the ſmall protuberances of mulberries, ſtrawberries, &c. and by ſome applied to grapes. Generally it is uſed for thoſe ſmall grains growing in bunches, after the manner of grapes, as *Liguſtrum*, &c.

ACIS, in fabulous hiſtory, the ſon of Faunus and Simetheis, was a beautiful ſhepherd of Sicily, who being beloved by Galatea, Polyphemus the giant was ſo enraged, that he daſhed out his brains againſt a rock; after which Galatea turned him into a river, which was called by his name.

Acis, (Ovid, Theocritus); a river of Sicily, running from a very cold ſpring, in the woody and ſhady

foot of mount Ætna, eaftward into, and not much above a mile from, the fea, along green and pleafant banks, with the fpeed of an arrow, from which it takes its name. It is now called *Aci Iaci*, or *Chinci*, according to the different Sicilian dialects: Antonine calls it *Acius*. Alfo the name of a hamlet at the mouth of the *Acis*.

ACKNOWLEDGMENT, in a general fenfe, is a perfon's owning or confeffing a thing; but, more particularly, is the expreffion of gratitude for a favour.

Acknowledgment-Money, a certain fum paid by tenants, in feveral parts of England, on the death of their landlords, as an acknowledgment of their new lords.

ACLIDES, in Roman antiquity, a kind of miffive weapon, with a thong affixed to it, whereby to draw it back. Moft authors defcribe it as a fort of dart or javelin; but Scaliger makes it roundifh or globular, and full of fpikes, with a flender wooden ftem to poife it by.

ACLOWA, in botany, a barbarous name of a fpecies of Colutea. It is ufed by the natives of Guinea to cure the itch: They rub it on the body as we do unguents.

ACME, the top or height of any thing. It is ufually applied to the maturity of an animal juft before it begins to decline; and phyficians have ufed it to exprefs the utmoft violence or crifis of a difeafe.

ACMELLA, in botany, the trivial name of a fpecies of Spilanthus.

ACMONIA, and Agmonia, in Peutinger's map, a town of Phrygia Major, now in ruins. The inhabitants are called *Acmonenfes* by Cicero, and the city *Civitas Acmonenfis*. Alfo a city of Dacia (Ptolemy), on the Danube, near the ruins of Trajan's bridge, built by Severus, and called *Severicum;* diftant 12 German miles from Temefwar, to the fouth-eaft.

ACNIDA, Virginian Hemp, in botany, a genus of the diœcia order, belonging to the pentandria clafs of plants; and, in the Natural Order, affociating with the *Scabridæ* (53). The characters are: In the *male*, the *calyx* is a perianthium confifting of five leaves, ovate, concave, acute, and membranous on the margin. No *corolla*. The *ftamina* confift of five very fhort capillary filaments; the antheræ are verfatile, two-celled, and forked at both ends.—*Female* on a feparate plant; of which the *calyx* confifts of an involucrum many-leav'd, linear, and deciduous; and a perianthium two-leaved, very fmall, and perfiftent. No *corolla*. The *piftillum* has an ovate germen; the ftyli are five, long, reflected, and downy; the ftigmata are fimple. The *pericarpium* is an egg-fhaped fruit, compreffed, many-angled, fulcated, and covered with a fucculent calyx. The *feed* is folitary, round, and compreffed. There is only one fpecies of it, *viz.* the acnida cannabina. It is a native of Virginia; but rarely cultivated in Europe, except for the fake of variety. It has little beauty, and at prefent is applied to no ufeful purpofe.

ACNUA, in Roman antiquity, fignified a certain meafure of land, near about the Englifh rood, or fourth part of an acre.

ACOEMETÆ, or Acoemeti, in church-hiftory; or, Men who lived without fleep: A fet of monks who chanted the divine fervice night and day in their places of worfhip. They divided themfelves into three bodies, who alternately fucceeded one another, fo that their churches were never filent. This practice they founded upon the precept, *Pray without ceafing*. They flourifhed in the eaft about the middle of the 5th century. There are a kind of acoemeti ftill fubfifting in the Roman church, *viz.* the religious of the holy facrament, who keep up a perpetual adoration, fome one or other of them praying before the holy facrament day and night.

ACOLUTHI, or Acoluthists, in antiquity, was an appellation given to thofe perfons who were fteady and immoveable in their refolutions: and hence the ftoics, becaufe they would not forfake their principles, nor alter their refolutions, acquired the title of Acoluthi. The word is Greek, and compounded of α, priv. and κολευθος, way; as never turning from the original courfe.

Acoluthi, among the ancient Chriftians, implied a peculiar order of the inferior clergy in the Latin church; for they were unknown to the Greeks for above 400 years. They were next to the fub-deacon; and we learn from the fourth council of Carthage, that the archdeacon, at their ordination, put into their hands a candleftick with a taper, giving them thereby to underftand that they were appointed to light the candles of the church; as alfo an empty pitcher, to imply that they were to furnifh wine for the eucharift. Some think they had another office, that of attending the bifhop wherever he went. The word is Greek, and compounded of α, priv. and κωλυω, to hinder or difturb.

ACOLYTHIA, in the Greek church, denotes the office or order of divine fervice; or the prayers, ceremonies, hymns, &c. whereof the Greek fervice is compofed.

ACOMA, a town of North America, in New Mexico, feated on a hill, with a good caftle. To go into the town, you muft walk up 50 fteps cut out of the rock. It is the capital of that province, and was taken by the Spaniards in 1599. W. Long. 104. 15. Lat. 35. 0.

ACOMAC, the name of a county in Virginia. It is on the eaftern fide of the Chefepeak bay, on a flip of land, by the Virginians called the *eaftern fhore*.

ACOMINATUS (Nicetas), was fecretary to Alexius Comnenus and to Ifaacus Angelus fucceffively: he wrote an hiftory from the death of Alexius Comnenus 1118, where Zonaras ended his, to the year 1203, which has undergone many impreffions, and is much applauded by the beft critics.

ACONITE. See Aconitum.

Winter Aconite. See Helleborus.

ACONCROBA, in botany, the indigenous name of a plant which grows wild in Guinea, and is in great efteem among the natives for its virtues in the fmall-pox. They give an infufion of it in wine. The leaves of this plant are opake, and as ftiff as thofe of the philyrea; they grow in pairs, and ftand on fhort footftalks; they are fmall at each end, and broad in the middle; and the largeft of them are about three inches in length, and an inch and quarter in breadth in the middle. Like thofe of our bay, they are of a dufky colour on the upper fide, and of a pale green underneath.

Aconiti, Aconitum.

ACONITI, in antiquity, an appellation given to ſome of the ATHLETÆ, but differently interpreted. Mercurialis underſtands it of thoſe who only anointed their bodies with oil, but did not ſmear themſelves over with duſt, as was the uſual practice.

ACONITUM, ACONITE, WOLFSBANE, or MONKSHOOD; a genus of the trigynia order, belonging to the polyandria claſs of plants. In the natural order, it aſſociates with the *Multiſiliquæ*, 26. The characters are: There is no *calyx*. The *corolla* conſiſts of five unequal petals oppoſite in pairs; the higheſt helmet-tubed, inverted, and obtuſe; the two lateral ones, broad, roundiſh, oppoſite, and converging; the two loweſt, oblong, and looking downwards: The nectaria are two, piped, nodding, and ſitting on long ſubulated peduncles, and concealed under the higheſt petal: The ſcales are ſix, very ſhort, coloured, and in an orb with the nectaria. The *ſtamina* conſiſt of numerous ſmall ſubulated filaments; the antheræ are erect and ſmall. The *piſtillum* has three [five] oblong germens, ending in ſtyli the length of the ſtamina; the ſtigmata are ſimple and reflected. The *pericarpium* has three or five univalve capſules gaping inward. The *ſeeds* are numerous, angular, and wrinkled.

Species. 1. The lycoctonum, or yellow wolfsbane, grows upwards of three feet high, flowers about the middle of June, and if the ſeaſon is not warm will continue in flower till Auguſt. 2. The altiſſimum, or greateſt yellow wolfsbane, grows upwards of four feet high, and the ſpikes of its flower are much longer in this ſort than the former. 3. The variegatum, or leſſer wolfsbane, ſeldom grows more than two feet high; it carries blue flowers, and the ſpikes of them are much ſhorter than either of the two laſt. 4. The anthora, or wholeſome wolfsbane, flowers in the middle of Auguſt, and often continues in beauty till the middle of September; its flowers are not large, but are of a beautiful ſulphur-yellow colour. 5. The napellus, bears large blue flowers, which appear in Auguſt, and make a pretty appearance. There are two or three varieties of this kind; one with white, another with roſe-coloured, and a third with variegated flowers; but theſe are only varieties which often change. 6. The pyramidale, or common blue monkſhood, bears a long ſpike of blue flowers, which appear ſooner than any of the other ſorts, being ſo early as June, or ſometimes even May. The ſpikes of flowers are upwards of two feet long, ſo that it makes a pretty appearance; the ſeeds are ripe in September. 7. The alpinum, or large-flowered monkſhood, flowers in Auguſt, and will grow to the height of five feet in good ground; the flowers are very large, of a deep blue colour, but not many upon each ſpike. 8. The pyreniacum, or Pyrenean monkſhood, flowers in July. It grows about four feet high, and carries a long ſpike of yellow flowers. 9. The cammarum, grows about four feet high, and flowers in the beginning of July. 10. The orientale, or eaſtern monkſhood, grows ſometimes more than ſix feet high, and bears a white flower.

Culture. All theſe ſpecies, except the laſt, are natives of the Alps, the mountains of Germany, Auſtria, and Tartary; ſo require a cool ſhady ſituation, except the wholeſome woolfsbane, which muſt have an open expoſure. They thrive better in a moiſt than dry ſoil: but the ground muſt not be ſo wet as to have the water ſtanding near their roots in the winter-time. They may all be propagated by ſowing their ſeeds in autumn, upon a north border, where they are ſcreened from the ſun. The plants will come up in the ſpring, when they muſt be kept clean from weeds during the ſummer-months; and, in very dry ſeaſons, if they are frequently refreſhed with water, their growth will be greatly promoted. The following autumn they ſhould be tranſplanted into ſhady borders, in rows a foot aſunder, and the plants ſix inches diſtant from one another. In this ſituation they may remain two years, when they will carry flowers, and ſo may be tranſplanted to thoſe places where they are to remain. The eaſtern monkshood is a native of the Levant, from whence the ſeeds of it were firſt ſent by Dr Tournefort to the royal garden at Paris, from whence ſome other gardens have been furniſhed with ſeeds. It is very rare in Europe at preſent.

Qualities. Since the time of Theophraſtus, moſt of the ſpecies of monkſhood have been reckoned a deadly poiſon both to men and brutes. Dioſcorides, however, recommends the external application of common monkshood for pains of the eyes. The flowers of a great many ſpecies communicate their noxious quality by being ſmelled to; and thoſe of the ſpecies called *napellus* being placed on the head, occaſion a violent megrim. Of the bad qualities of theſe plants we ſometimes avail ourſelves to get rid of vermin. A decoction of the roots deſtroyed bugs; the ſame part being powdered, and adminiſtered in bread or ſome other palatable vehicle to rats and mice, corrodes and inflames their inteſtines, and ſoon proves mortal. The juice of the plant is uſed to poiſon fleſh with, for the deſtruction of wolves, foxes, and other ravenous beaſts. The beſt antidote to the poiſon of the different monkshoods is ſaid to be the root of the anthora, a ſpecies of the ſame genus, hence termed *healthful* or *wholeſome monkſhood*. The ſame plant is regarded as efficacious againſt bites of ſerpents and other venomous creatures. The roots have a bitter acrid taſte; the leaves are only bitter: the former are chiefly uſed in medicine; and, beſides the excellent quality juſt mentioned, are ſtomachic, and promote perſpiration. The peaſants, who gather the plants on the Alps and Pyrenees, are ſaid to uſe it with ſucceſs againſt the biting of mad dogs, and to cure the colic. It is remarkable, that the monkshoods with blue flowers are much more virulent than the yellow or white-flowered kinds. Miller aſſerts that the huntſmen of the wolves and other wild beaſts on the Alps, dip their arrows into the juice of thoſe plants, which renders the wounds made by them deadly.

That the anthora is an antidote to the poiſon of the reſt of the ſpecies, is not conſidered as a fact ſufficiently eſtabliſhed. Of the effects of the above, indeed, and other vegetable poiſons, medical writers give but a confuſed account. In general, thoſe which are not of the narcotic kind, nor excite violent vomitings and purgings, produce their pernicious effects by irritating the nervous coats of the ſtomach and inteſtines, ſo as to occaſion violent convulſions, not only in them, but through the whole body. The proper cure is evacuation by vomit: but this is not to be obtained without ſome difficulty; becauſe there is uſually ſuch a contraction about the upper orifice of the ſtomach, that nothing

thing can either be ſwallowed or thrown up. In this caſe, an infuſion of tobacco has been recommended, and may probably be of ſervice: for being itſelf of a very ſtimulating nature, it may for a moment take off the violent ſpaſms occaſioned by the poiſon; in which caſe, a violent vomiting will immediately enſue.—The ſtomach being thoroughly emptied, and deglutition rendered eaſy, the cure may be completed by oily and mucilaginous medicines. On account of the poiſonous qualities of monkſhood, no ſpecies of it ſhould be planted where children have acceſs, leſt they ſhould suffer by putting the leaves or flowers in their mouths, or rubbing them about their eyes; for the juice of the leaves will occaſion great diſorder by being only rubbed upon very tender fleſh; and the farina of the flowers, when blown into the eyes, cauſes them to ſwell greatly.

ACONTIAS, in zoology, an obſolete name of the anguis jaculis, or dart-ſnake, belonging to the order of amphibia ſerpentes. See Anguis.

ACONTIUM, ακοντιον, in Grecian antiquity, a kind of dart or javelin, reſembling the Roman pilum.

ACONTIUS (James), a philoſopher, civilian, and divine, born at Trent in the 16th century: he embraced the reformed religion; and, coming into England in the reign of queen Eliſabeth, was much honoured by her, which he acknowledges in a book dedicated to that queen. This work is his celebrated Collection of the Stratagems of Satan, which has been ſo often tranſlated, and borne ſo many editions.

ACOSTAN, a mountainous iſland in the north ſeas between Aſia and America, obſerved by captain Cook.

ACORN, the fruit of the oak-tree. See Quercus.

Acorn, (in ſea-language), a little ornamental piece of wood, faſhioned like a cone, and fixed on the uppermoſt point of the ſpindle, above the vane, on the maſthead. It is uſed to keep the vane from being blown off from the ſpindle in a whirlwind, or when the ſhip leans much to one ſide under ſail.

ACORUS, Calamus Aromaticus, Sweet Flag, or Sweet Rush: A genus of the monogynia order, belonging to the hexandria claſs of plants; and ranking in the ſecond natural order, *Piperitæ*. The characters are: The *calyx* is a cylindric ſimple ſpadix covered with florets; there is no *ſpatha*, nor *perianthium*. The *corolla* is compoſed of ſix obtuſe, concave, looſe petals. The *ſtamina* conſiſt of ſix thickiſh filaments, ſomewhat longer than the corolla; the antheræ are thickiſh and didymous. The *piſtillum* has a gibbous oblong germen the length of the ſtamina; no ſtylus; the ſtigma a prominent point. The *pericarpium* is a ſhort triangular, obtuſe, three-celled capſule, attenuated at both ends. The *ſeeds* are numerous, and of an oblong egg-ſhape.

There is but one ſpecies, the acorus calamus. It grows naturally in ſhallow ſtanding waters, and is found wild in ſome parts of Britain. It grows plentifully in rivulets and marſhy places about Norwich and other parts of this iſland, in the canals of Holland, in Switzerland, and in other countries of Europe. The ſhops have been uſually ſupplied from the Levant with dried roots, which do not appear to be ſuperior to thoſe of our own growth. The leaves are ſometimes two feet long, narrow, compreſſed, ſmooth, and of a bright green, terminating in a point; the root is pretty long, of a whitiſh, reddiſh, and partly greeniſh colour. Among the leaves there ariſes a ſingle one, thicker and more robuſt than the reſt, furrowed on the ſurface, and of a paler green. On this grow frequently two ſpikes of flowers, by many writers called *juli*. Theſe are of a brown colour, having a chequered ſurface. The root of this plant has a very agreeable flavour, which is greatly improved by drying. It is reckoned carminative and ſtomachic, having a warm, pungent, bitteriſh taſte; ſo is frequently uſed as an ingredient in bitters. It has been complained of, however, as communicating a nauſeous flavour to thoſe bitters in which it was infuſed; and Neumann obſerves, that its agreeable flavour, as well as its diſtinguiſhing taſte, reſide entirely in a volatile eſſential oil; the reſiduum after diſtillation having a nauſeous flavour, not at all reſembling that of the calamus. It is an ingredient in the mithridate and theriaca of the London pharmacopœia; and in the aromatic and ſtomachic tinctures, and compound arum powder, of the Edinburgh. The freſh root candied is ſaid to be employed at Conſtantinople as a preſervative againſt epidemic diſeaſes. The leaves of this plant have a ſweet fragrant ſmell, more agreeable, though weaker, than that of the roots. Neither horſes, cows, goats, ſheep, nor ſwine, will eat the herb, or its roots.

Culture. The acorus being a perennial plant, may be tranſplanted into a garden, where it will thrive very well if the ground is moiſt; but never flowers unleſs it grows in water. It loves an open ſituation, and will not thrive well under the ſhade of trees. The flowers appear the latter end of June, and continue till Auguſt.

Acorus, in the materia medica, a name ſometimes given to the great galangal. See Kempferia.

Acorus, in natural hiſtory, blue coral. The true ſort is very ſcarce; ſome, however, is fiſhed on the coaſts of Africa, particularly from Rio del Re to the river of the Camarones. This coral is part of the merchandiſe which the Dutch trade for with the Camarones: that of the kingdom of Benin is alſo very much eſteemed. It grows in form of a tree on a rocky bottom.

ACOUSMATICI, ſometimes alſo called *Acouſtici*, in Grecian antiquity, ſuch of the diſciples of Pythagoras as had not completed their five years probation.

ACOUSTIC, in general, denotes any thing that relates to the ear, the ſenſe of hearing, or the doctrine of ſounds.

Acoustic *Duct*, in anatomy, the ſame with meatus auditorius, or the external paſſage of the ear. See Anatomy.

Acoustic Inſtrument, or auricular tube. See Acoustics, n° 26.

Acoustic Veſſels, in the ancient theatres, were a kind of veſſels, made of braſs, ſhaped in the bell faſhion, which being of all tones within the pitch of the voice or even of inſtruments, rendered the ſounds more audible, ſo that the actors could be heard through all parts of theatres, which were even 400 feet in diameter.

Acoustic Diſciples, among the ancient Pythagoreans, thoſe more commonly called Acousmatici.

The *Science* of

ACOUSTICS

A C O U S T I C S

1 Diacouſtics. INSTRUCTS us in the nature of ſound. It is divided by ſome writers into *Diacouſtics*, which explains the properties of thoſe ſounds that come directly

2 Catacouſtics. from the ſonorous body to the ear; and *Catacouſtics*, which treats of reflected ſounds: but ſuch diſtinction does not appear to be of any real utility.

Chap. I. *Different Theories of Sound.*

3 Of the vehicles of ſound. Moſt ſounds, we all know, are conveyed to us on the boſom of the air. In whatever manner they either float upon it, or are propelled forward in it, certain it is, that, without the vehicle of this or ſome other fluid, we ſhould have no ſounds at all. Let the air be exhauſted from a receiver, and a bell ſhall emit no ſound when rung in the void; for, as the air continues to grow leſs denſe, the ſound dies away in proportion, ſo that at laſt its ſtrongeſt vibrations are almoſt totally ſilent.

4 Air not the only one. Thus air is a vehicle for ſound. However, we muſt not, with ſome philoſophers, aſſert, that it is the only vehicle; that, if there were no air, we ſhould have no ſounds whatſoever: for it is found by trial, that ſounds are conveyed through water almoſt with the ſame facility with which they move through air. A bell rung in water returns a tone as diſtinct as if rung in air. This was obſerved by Derham, who alſo remarked that the tone came a quarter deeper. Some naturaliſts aſſure us alſo, that fiſhes have a ſtrong perception of ſounds, even at the bottom of deep rivers (A). From hence, it would ſeem not to be very material in the propagation of ſounds, whether the fluid which conveys them be elaſtic or otherwiſe. Water, which, of all ſubſtances that we know, has the leaſt elaſticity, yet ſerves to carry them forward; and if we make allowance for the difference of its denſity, perhaps the ſounds move in it with a proportional rapidity to what they are found to do in the elaſtic fluid of air.

One thing however is certain, that whether the fluid which conveys the note be elaſtic or non-elaſtic, whatever ſound we hear is produced by a ſtroke, which the ſounding body makes againſt the fluid, whether air or water. The fluid being ſtruck upon, carries the impreſſion forward to the ear, and there produces its ſenſation. Philoſophers are ſo far agreed, that they all 5 What ſound is, and how propagated.
allow that ſound is nothing more than the impreſſion made by an elaſtic body upon the air or water (B), and this impreſſion carried along by either fluid to the organ of hearing. But the manner in which this conveyance is made, is ſtill diſputed: Whether the ſound is diffuſed into the air, in circle beyond circle, like the waves of water when we diſturb the ſmoothneſs of its ſurface by dropping in a ſtone; or whether it travels along, like rays diffuſed from a centre, ſomewhat in the ſwift manner that electricity runs along a rod of iron; theſe are the queſtions which have divided the learned.

Newton was of the firſt opinion. He has explained 6 Newton's theory.
the progreſſion of ſound by an undulatory, or rather a vermicular, motion in the parts of the air. If we have an exact idea of the crawling of ſome inſects, we ſhall have a tolerable notion of the progreſſion of ſound upon this hypotheſis. The inſect, for inſtance, in its motion, firſt carries its contractions from the hinder part, in order to throw its fore-part to the proper diſtance, then it carries its contractions from the fore-part to the hinder to bring that forward. Something ſimilar to this is

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(A) Dr Hunter has proved this, and demonſtrated the auricular organ in theſe animals. See Fish, and Comparative *Anatomy*.

(B) Though air and water are both vehicles of ſound, yet neither of them ſeems to be ſo by itſelf, but only as it contains an exceedingly ſubtile fluid capable of penetrating the moſt ſolid bodies. Hence, by the medium of that fluid, ſounds can be propagated through wood, or metals, even more readily than through the open air. By the ſame means, deaf people may be made ſenſible of ſounds, if they hold a piece of metal in their mouth, one end of which is applied to the ſounding body. As it is certain, therefore, that air cannot penetrate metals, we muſt acknowledge the medium of ſound to be of a more ſubtile nature; and thus the electrical fluid will naturally occur as the proper one. But why then is ſound no longer heard in an exhauſted receiver, if the air is not the fluid by which it is conveyed, ſeeing the electrical matter cannot be excluded? The reply to this is obvious: The electrical fluid is ſo exceedingly ſubtile, and pervades ſolid bodies with ſo much eaſe, that any motion of a ſolid body in a quantity of electric matter by itſelf, can never excite a degree of agitation in it ſufficient for producing a ſound; but if the electric fluid is entangled among the particles of air, water, wood, metal, &c. whatever affects their particles will alſo affect this fluid, and produce an audible noiſe. In the experiment of the air-pump, however, there may be an ambiguity, as the gradual exhauſting of the air creates an increaſing difference of preſſure on the outſide, and may occaſion in the glaſs a difficulty of vibrating, ſo as to render it leſs fit to communicate to the air without the vibrations that ſtrike it from within. From this cauſe the diminution of ſound in an exhauſted receiver may be ſuppoſed to proceed, as well as from the diminution of the air. But if any internal agitation of its parts ſhould happen to the electrical fluid, exceeding loud noiſes might be propagated through it, as has been the caſe when large meteors have kindled at a great diſtance from the earth. It is alſo difficult to account for the exceeding great ſwiftneſs of ſound, upon the ſuppoſition that it is propagated by means of air alone; for nothing is more certain, than that the ſtrongeſt and moſt violent gale is, in its courſe, inert and ſluggiſh, compared with the motion of ſound.

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Plate I. fig. 1.

is the motion of the air when ſtruck upon by a ſounding body. To be a little more preciſe, ſuppoſe ABC, the ſtring of an harpſichord ſcrewed to a proper pitch, and drawn out of the right line by the finger at B. We ſhall have occaſion elſewhere to obſerve, that ſuch a ſtring would, if let go, vibrate to E; and from E to D, and back again; that it would continue thus to vibrate like a pendulum for ever, if not externally reſiſted, and, like a pendulum, all its little vibrations would be performed in equal times, the laſt and the firſt being equally long in performing; alſo, that, like a pendulum, its greateſt ſwiftneſs would always be when it arrived at E, the middle part of its motion. Now then, if this ſtring be ſuppoſed to fly from the finger at B, it is obvious, that whatever be its own motion, ſuch alſo will be the motion of the parts of air that fly before it. Its motion, as is obvious, is firſt uniformly accelerated forward from B to E, then retarded as it goes from E to D, accelerated back again as it returns from D to E, and retarded from E to B. This motion being therefore ſent in ſucceſſion through a range of elaſtic air, it muſt happen, that the parts of one range of air muſt be ſent forward with accelerated motion, and then with a retarded motion. This accelerated motion reaching the remoteſt end of the firſt range will be communicated to a ſecond range, while the neareſt parts of the firſt range being retarded in their motion, and falling back with the receſſion of the ſtring, retire firſt with an accelerated, then with a retarded motion, and the remoteſt parts will ſoon follow. In the mean time, while the parts of the firſt range are thus falling back, the parts of the ſecond range are going forward with an accelerated motion. Thus there will be an alternate condenſation and relaxation of the air, during the time of one vibration; and as the air going forward ſtrikes any oppoſing body with greater force than upon retiring, ſo each of theſe accelerated progreſſions have been called by Newton a *pulſe* of ſound.

Thus will the air be driven forward in the direction of the ſtring. But now we muſt obſerve, that theſe pulſes will move every way; for all motion impreſſed upon fluids in any direction whatſoever, operates all around in a ſphere: ſo that ſounds will be driven in all directions, backwards, forwards, upwards, downwards, and on every ſide. They will go on ſucceeding each other, one on the outſide of the other, like circles in diſturbed water; or rather, they will lie one without the other, in concentric ſhells, ſhell above ſhell, as we ſee in the coats of an onion.

All who have remarked the tone of a bell, while its ſounds are decaying away, muſt have an idea of the pulſes of ſound, which, according to Newton, are formed by the air's alternate progreſſion and receſſion. And it muſt be obſerved, that as each of theſe pulſes is formed by a ſingle vibration of the ſtring, they muſt be equal to each other; for the vibrations of the ſtring are known to be ſo.

Again, as to the velocity with which ſounds travel, this Newton determines, by the moſt difficult calculation that can be imagined, to be in proportion to the thickneſs of the parts of the air, and the diſtance of theſe parts from each other. From hence he goes on to prove, that each little part moves backward and forward like a pendulum; and from thence he proceeds to demonſtrate, that if the atmoſphere were of the ſame denſity every where as at the ſurface of the earth, in ſuch a caſe, a pendulum, that reached from its higheſt ſurface down to the ſurface of the earth, would by its vibrations diſcover to us the proportion of the velocity with which ſounds travel. The velocity with which each pulſe would move, he ſhows, would be as much greater than the velocity of ſuch a pendulum ſwinging with one complete vibration, as the circumference of a circle is greater than the diameter. From hence he calculates, that the motion of ſound will be 979 feet in one ſecond. But this not being conſonant to experience, he takes in another conſideration, which deſtroys entirely the rigour of his former demonſtration, namely, vapours in the air; and then finds the motion of ſound to be 1142 feet in one ſecond, or near 13 miles in a minute: a proportion which experience had eſtabliſhed nearly before.

7 Preceding Theory oppoſed.

Thus much will ſerve to give an obſcure idea of a theory which has met with numbers of oppoſers. Even John Bernouilli, Newton's greateſt diſciple, modeſtly owns that he did not pretend to underſtand this part of the *Principia*. He attempted therefore to give a more perſpicuous demonſtration of his own, that might confirm and illuſtrate the Newtonian theory. The ſubject ſeemed to reject elucidation: his theory is obviouſly wrong, as D'Alembert has proved in his Theory of Fluids.

8 The objections.

Various have been the objections that have been made to the Newtonian ſyſtem of ſounds. It is urged, that this theory can only agree with the motion of ſound in an elaſtic fluid, whereas ſounds are known to move forward through water that is not elaſtic. To explain their progreſs therefore through water, a ſecond theory muſt be formed: ſo that two theories muſt be made to explain a ſimilar effect; which is contrary to the ſimplicity of true philoſophy, for it is contrary to the ſimplicity of nature. It is farther urged, that this ſlow vermicular motion but ill repreſents the velocity with which ſounds travel, as we know by experience that it is almoſt 13 miles in a minute. In ſhort, it is urged, that ſuch undulations as have been deſcribed, when coming from ſeveral ſonorous bodies at once, would croſs, obſtruct, and confound each other; ſo that, if they were conveyed to the ear by this means, we ſhould hear nothing but a medley of diſcord and broken articulations. But this is equally with the reſt contradictory to experience, ſince we hear the fulleſt concert, not only without confuſion, but with the higheſt pleaſure. Theſe objections, whether well founded or not, have given riſe to another theory: which we ſhall likewiſe lay before the reader; though it too appears liable to objections, which ſhall be afterwards mentioned.

9 Another Theory.

Every ſound may be conſidered as driven off from the ſounding body in ſtraight lines, and impreſſed upon the air in one direction only: but whatever impreſſion is made upon a fluid in one direction, is diffuſed upon its ſurface into all directions; ſo that the ſound firſt driven directly forward ſoon fills up a wide ſphere, and is heard on every ſide. Thus, as it is impreſſed, it inſtantaneouſly travels forward with a very ſwift motion, reſembling the velocity with which we know electricity flies from one end of a line to another.

Now, as to the pulſes, or cloſe ſhakes as the muſicians expreſs it, which a ſounding body is known to make

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make, each pulse (say the supporters of this theory) is itself a distinct and perfect sound, and the interval between every two pulses is profoundly silent. Continuity of sound from the same body is only a deception of the hearing; for as each distinct sound succeeds at very small intervals, the organ has no time to transmit its images with equal swiftness to the mind, and the interval is thus lost to sense: just as in seeing a flaming torch, if flared round in a circle, it appears as a ring of fire. In this manner a beaten drum, at some small distance, presents us with the idea of continuing sound. When children run with their sticks along a rail, a continuing sound is thus represented, though it need scarce be observed that the stroke against each rail is perfectly distinct and insulated.

According to this theory, therefore, the pulses are nothing more than distinct sounds repeated by the same body, the first stroke or vibration being ever the loudest, and travelling farther than those that follow; while each succeeding vibration gives a new sound, but with diminished force, till at last the pulses decay away totally, as the force decays that gives them existence.

All bodies whatsoever that are struck return more or less a sound: but some, wanting elasticity, give back no repetition of the sound; the noise is at once begotten and dies: while other bodies, however, there are, which being more elastic and capable of vibration, give back a sound, and repeat the same several times successively. These last are said to have a tone; the others are not allowed to have any.

This tone of the elastic string, or bell, is notwithstanding nothing more than a similar sound of what the former bodies produced, but with the difference of being many times repeated while their note is but single. So that, if we would give the former bodies a tone, it will be necessary to make them repeat their sound, by repeating our blows swiftly upon them. This will effectually give them a tone; and even an unmusical instrument has often had a fine effect by its tone in our concerts.

Let us now go on then to suppose, that by swift and equably continued strokes we give any non-elastic body its tone: it is very obvious, that no alterations will be made in this tone by the quickness of the strokes, though repeated ever so fast. These will only render the tone more equal and continuous, but make no alteration in the tone it gives. On the contrary, if we make an alteration in the force of each blow, a different tone will then undoubtedly be excited. The difference will be small, it must be confessed; for the tones of these inflexible bodies are capable but of small variation; however, there will certainly be a difference. The table on which we write, for instance, will return a different sound when struck with a club, from what it did when struck only with a switch. Thus non-elastic bodies return a difference of tone, not in proportion to the swiftness with which their sound is repeated, but in proportion to the greatness of the blow which produced it; for in two equal non-elastic bodies, that body produced the deepest tone which was struck by the greatest blow.

We now then come to a critical question, What is it that produces the difference of tone in two elastic sounding bells or strings? Or what makes one deep and the other shrill? This question has always been hitherto answered by saying, that the depth or height of the note proceeded from the slowness or swiftness of the times of the vibrations. The slowest vibrations, it has been said, are qualified for producing the deepest tones, while the swiftest vibrations produce the highest tones. In this case, an effect has been given for a cause. It is in fact the force with which the sounding string strikes the air when struck upon, that makes the true distinction in the tones of sounds. It is this force, with greater or less impressions, resembling the greater or less force of the blows upon a non-elastic body, which produces correspondent affections of sound. The greatest forces produce the deepest sounds: the high notes are the effect of small efforts. In the same manner a bell, wide at the mouth, gives a grave sound; but if it be very massy withal, that will render it still graver; but if massy, wide, and long or high, that will make the tone deepest of all.

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Thus, then, will elastic bodies give the deepest sound, in proportion to the force with which they strike the air: but if we should attempt to increase their force by giving them a stronger blow, this will be in vain; they will still return the same tone; for such is their formation, that they are sonorous only because they are elastic, and the force of this elasticity is not increased by our strength, as the greatness of a pendulum's vibration will not be increased by falling from a greater height.

Thus far of the length of chords. Now as to the frequency with which they vibrate the deepest tones, it has been found, from the nature of elastic strings, that the longest strings have the widest vibrations, and consequently go backward and forward slowest; while, on the contrary, the shortest strings vibrate the quickest, or come and go in the shortest intervals. From hence those who have treated of sounds, have asserted, as was said before, that the tone of the string depended upon the length or the shortness of the vibrations. This, however, is not the case. One and the same string, when struck, must always, like the same pendulum, return precisely similar vibrations; but it is well known, that one and the same string, when struck upon, does not always return precisely the same tone: so that in this case the vibrations follow one rule, and the tone another. The vibrations must be invariably the same in the same string, which does not return the same tone invariably, as is well known to musicians in general. In the violin, for instance, they can easily alter the tone of the string an octave or eight notes higher, by a softer method of drawing the bow; and some are known thus to bring out the most charming airs imaginable. These peculiar tones are by the English fiddlers called *flute-notes*. The only reason, it has been alleged, that can be assigned for the same string thus returning different tones, must certainly be the different force of its strokes upon the air. In one case, it has double the tone of the other; because upon the soft touches of the bow, only half its elasticity is put into vibration.

This being understood (continue the authors of this theory), we shall be able clearly to account for many things relating to sounds that have hitherto been inexplicable. Thus, for instance, if it be asked, When two strings are stretched together of equal lengths, tensions, and thickness, how does it happen, that one of them being struck, and made to vibrate throughout,

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throughout, the other ſhall vibrate throughout alſo? the anſwer is obvious: The force that the ſtring ſtruck receives is communicated to the air, and the air communicates the ſame to the ſimilar ſtring; which therefore receives all the force of the former; and the force being equal, the vibrations muſt be ſo too. Again, put the queſtion, If one ſtring be but half the length of the other, and be ſtruck, how will the vibrations be? The anſwer is, The longeſt ſtring will receive all the force of the ſtring half as long as itſelf, and therefore it will vibrate in proportion, that is, through half its length. In the ſame manner, if the longeſt ſtring were three times as long as the other, it would only vibrate in a third of its length; or if four times, in a fourth of its length. In ſhort, whatever force the ſmaller ſtring impreſſes upon the air, the air will impreſs a ſimilar force upon the longer ſtring, and partially excite its vibrations.

10 Eolian Lyre. See Plate I. fig. 2.

From hence alſo we may account for the cauſe of thoſe charming, melancholy gradations of ſound in the Eolian lyre; an inſtrument (ſays Sir John Hawkins) lately obtruded upon the public as a new invention, though deſcribed above a century ago by Kircher *. This inſtrument is eaſily made, being nothing more than a long narrow box of thin dale, about 30 inches long, 5 inches broad, and $1\frac{1}{4}$ inches deep, with a circle in the middle of the upper ſide or belly about $1\frac{1}{2}$ inch diameter, pierced with ſmall holes. On this ſide are ſeven, ten, or (according to Kircher) fifteen or more ſtrings of very fine gut, ſtretched over bridges at each end, like the bridge of a fiddle, and ſcrewed up or relaxed with ſcrew-pins (B). The ſtrings are all tuned to one and the ſame note; and the inſtrument is placed in ſome current of air, where the wind can bruſh over its ſtrings with freedom. A window with the ſaſh juſt raiſed to give the air admiſſion, will anſwer this purpoſe exactly. Now when the entering air blows upon theſe ſtrings with different degrees of force, there will be excited different tones of ſound; ſometimes the blaſt brings out all the tones in full concert; ſometimes it ſinks them to the ſofteſt murmurs; it feels for every tone, and by its gradations of ſtrength ſolicits thoſe gradations of ſound which art has taken different methods to produce.

* *Vide* Kircheri Muſurgia, lib. ix.

It remains, in the laſt place, to conſider (by this theory) the loudneſs and lowneſs, or, as the muſicians ſpeak, the ſtrength and ſoftneſs of ſound. In vibrating elaſtic ſtrings, the loudneſs of the tone is in proportion to the deepneſs of the note; that is, in two ſtrings, all things in other circumſtances alike, the deepeſt tone will be loudeſt. In muſical inſtruments upon a different principle, as in the violin, it is otherwiſe; the tones are made in ſuch inſtruments, by a number of ſmall vibrations crowded into one ſtroke. The roſined bow, for inſtance, being drawn along a ſtring, its roughneſſes catch the ſtring at very ſmall intervals, and excite its vibrations. In this inſtrument, therefore, to excite loud tones, the bow muſt be drawn quick, and this will produce the greateſt number of vibrations. But it muſt be obſerved, that the more quick the bow paſſes over the ſtring, the leſs apt will the roughneſs of its ſurface be to touch the ſtring at every inſtant; to remedy this, therefore, the bow muſt be preſſed the harder as it is drawn quicker, and thus its fulleſt ſound will be brought from the inſtrument. If the ſwiftneſs of the vibrations in an inſtrument thus rubbed upon, exceed the force of the deeper ſound in another, then the ſwift vibrations will be heard at a greater diſtance, and as much farther off as the ſwiftneſs in them exceeds the force in the other.

11 The nature of Muſical Sounds illuſtrated according to the ſame theory.

By the ſame theory (it is alleged) may all the phenomena of muſical ſounds be eaſily explained.—The fables of the ancients pretend, that muſic was firſt found out by the beating of different hammers upon the ſmith's anvil. Without purſuing the fable, let us endeavour to explain the nature of muſical ſounds by a ſimilar method. Let us ſuppoſe an anvil, or ſeveral ſimilar anvils, to be ſtruck upon by ſeveral hammers of different weights or forces. The hammer, which is double that of another, upon ſtriking the anvil will produce a ſound double that of the other: this double ſound muſicians have agreed to call an Octave. The ear can judge of the difference or reſemblance of theſe ſounds with great eaſe, the numbers being as one and two, and therefore very readily compared. Suppoſe that an hammer, three times leſs than the firſt, ſtrikes the anvil, the ſound produced by this will be three times leſs than the firſt: ſo that the ear, in judging the ſimilitude of theſe ſounds, will find ſomewhat more difficulty; becauſe it is not ſo eaſy to tell how often one is contained in three, as it is to tell how often it is contained in two. Again, ſuppoſe that an hammer four times leſs than the firſt ſtrikes the anvil, the ear will find greater difficulty ſtill in judging preciſely the difference of the ſounds; for the difference of the numbers four and one cannot ſo ſoon be determined with preciſion as three and one. If the hammer be five times leſs, the difficulty of judging will be ſtill greater. If the hammer be ſix times leſs, the difficulty ſtill increaſes, and ſo alſo of the ſeventh, inſomuch that the ear cannot always readily and at once determine the preciſe gradation. Now, of all compariſons, thoſe which the mind makes moſt eaſily, and with leaſt labour, are the moſt pleaſing. There is a certain regularity in the human ſoul, by which it finds happineſs in exact and ſtricking, and eaſily-made compariſons. As the ear is but an inſtrument of the mind, it is therefore moſt pleaſed with the combination of any two ſounds, the differences of which it can moſt readily diſtinguiſh. It is more pleaſed with the concord of two ſounds which are to each other as one and two, than of two ſounds which are as one and three, or one and four, or one and five, or one and ſix or ſeven. Upon this pleaſure, which the mind takes in compariſon, all harmony depends. The variety of ſounds is infinite; but becauſe the ear cannot compare two ſounds ſo as readily to diſtinguiſh their diſcriminations when they exceed the proportion of one and ſeven, muſicians have been content to confine all harmony within that compaſs, and allowed but ſeven notes in muſical compoſition.

Let us now then ſuppoſe a ſtringed inſtrument fitted up

(B) The figure repreſents the inſtrument with ten chords; of which ſome direct only eight to be tuned uniſons, and the two outermoſt octaves below them. But this ſeems not to be material.

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up in the order mentioned above. For inftance: Let the firft ftring be twice as long as the fecond; let the third ftring be three times fhorter than the firft; let the fourth be four times, the fifth ftring five times, and the fixth fix times as fhort as the firft. Such an inftrument would probably give us a reprefentation of the lyre as it came firft from the hand of the inventor. This inftrument will give us all the feven notes following each other, in the order in which any two of them will accord together moft pleafingly; but yet it will be a very inconvenient and a very difagreeable inftrument: inconvenient, for in a compafs of feven ftrings only, the firft muft be feven times as long as the laft; and difagreeable, becaufe this firft ftring will be feven times as loud alfo; fo that when the tones are to be played in a different order, loud and foft founds would be intermixed with moft difgufting alternations. In order to improve the firft inftrument, therefore, fucceeding muficians very judicioufly threw in all the other ftrings between the two firft, or, in other words, between the two Octaves, giving to each, however, the fame proportion to what it would have had in the firft natural inftrument. This made the inftrument more portable, and the founds more even and pleafing. They therefore difpofed the founds between the Octave in their natural order, and gave each its own proportional dimenfions. Of thefe founds, where the proportion between any two of them is moft obvious, the concord between them will be moft pleafing. Thus Octaves, which are as two to one, have a moft harmonious effect; the fourth and fifth alfo found fweetly together, and they will be found, upon calculation, to bear the fame proportion to each other that Octaves do. "Let it "not be fuppofed (fays Mr Saveur), that the mufical "fcale is merely an arbitrary combination of founds; "it is made up from the confonance and differences of "the parts which compofe it. Thofe who have often "heard a fourth and fifth accord together, will be "naturally led to difcover their difference at once; and "the mind unites itfelf to their beauties." Let us then ceafe to affign the coincidences of vibrations as the caufe of harmony, fince thefe coincidences in two ftrings vibrating at different intervals, muft at beft be but fortuitous; whereas concord is always pleafing. The true caufe why concord is pleafing, muft arife from our power, in fuch a cafe, of meafuring more eafily the differences of the tones. In proportion as the note can be meafured with its fundamental tone by large and obvious diftinctions, then the concord is moft pleafing; on the contrary, when the ear meafures the difcriminations of two tones by very fmall parts, or cannot meafure them at all, it lofes the beauty of their refemblance: the whole is difcord and pain (c).

But there is another property in the vibration of a mufical ftring not yet taken notice of, and which is alleged to confirm the foregoing theory. If we ftrike the ftring of an harpfichord, or any other elaftic founding chord whatever, it returns a continuing found. This till of late was confidered as one fimple uniform tone; but all muficians now confefs, that inftead of one tone it actually returns four tones, and that conftantly. The notes are, befide the fundamental tone, an octave above, a twelfth above, and a feventeenth. One of the bafs-notes of an harpfichord has been diffected in this manner by Rameau, and the actual exiftence of thefe tones proved beyond a poffibility of being controverted. In fact, the experiment is eafily tried; for if we fmartly ftrike one of the lower keys of an harpfichord, and then take the finger brifkly away, a tolerable ear will be able to diftinguifh, that, after the fundamental tone has ceafed, three other fhriller tones will be diftinctly heard; firft the octave above, then the twelfth, and laftly the feventeenth: the octave above is in general almoft mixed with the fundamental tone, fo as not to be eafily perceived, except by an ear long habituated to the minute difcriminations of founds. So that we may obferve, that the fmalleft tone is heard laft, and the deepeft and largeft one firft: the two others in order.

In the whole theory of founds, nothing has given greater room for fpeculation, conjecture, and difappointment, than this amazing property in elaftic ftrings. The whole ftring is univerfally acknowledged to be in vibration in all its parts, yet this fingle vibration returns no lefs than four different founds. They who account for the tones of ftrings by the number of their vibrations, are here at the greateft lofs. Daniel Bernouilli fuppofes, that a vibrating ftring divides itfelf into a number of curves, each of which has a peculiar vibration; and though they all fwing together in the common vibration, yet each vibrates within itfelf. This opinion, which was fupported, as moft geometrical fpeculations are, with the parade of demonftration, was only born foon after to die. Others have afcribed this to an elaftic difference in the parts of the air, each of which, at different intervals, thus received different impreffions from the ftring, in proportion to their elafticity. This is abfurd. If we allow the difference of tone to proceed from the force, and not the frequency, of the vibrations, this difficulty will admit of an eafy folution. Thefe founds, though they feem to exift together in the ftring, actually follow each other in fucceffion: while the vibration has greateft force, the fundamental tone is brought forward: the force of the vibration decaying, the octave is produced, but almoft only inftantaneoufly; to this fucceeds, with diminifhed force, the twelfth; and, laftly, the feventeenth is heard to vibrate with great diftinctnefs, while the three other tones are always filent. Thefe founds, thus excited, are all of them the harmonic tones, whofe differences from the fundamental tone are, as was faid, ftrong, and diftinct. On the other hand, the difcordant tones cannot be heard. Their differences being but very fmall, they are overpowered, and in a manner drowned in the tones of fuperior difference: yet not always neither; for Daniel Bernouilli has been able, from the fame ftroke, to make the fame ftring bring out its harmonic and its difcordant tones alfo (D.) So that from hence we may juftly infer, that every note whatfoever is

(c) It is certain, that in proportion to the fimplicity of relations in found, the ear is pleafed with its combinations; but this is not to be admitted as the caufe why muficians have confined all harmony to an octave. Difcriminated founds, whofe vibrations either never coincide, or at leaft very rarely, do not only ceafe to pleafe, but violently grate, the ear. Harmony and difcord, therefore, are neither difcriminated by the judgment of hearers, nor the inftitution of muficians, but by their own effential and immutable nature.

(D) Vid. Memoires de l'Academie de Berlin, 1753, p. 153.

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is only a succession of tones; and that those are most distinctly heard, whose differences are most easily perceivable.

12 Objections to the preceding theory.

To this theory, however, though it has a plausible appearance, there are strong and indeed insuperable objections. The very fundamental principle of it is false. No body whatever, whether elastic or non-elastic, yields a graver sound by being struck with a larger instrument, unless either the sounding body, or that part of it which emits the sound, is enlarged. In this case, the largest bodies always return the gravest sounds.

In speaking of elastic and non-elastic bodies in a musical sense, we are not to push the distinction so far as when we speak of them philosophically. A body is *musically* elastic, all of whose parts are thrown into vibrations so as to emit a sound when only part of their surface is struck. Of this kind are bells, musical strings, and all bodies whatever that are considerably hollow.—Musical non-elastics are such bodies as emit a sound only from that particular place which is struck: thus, a table, a plate of iron nailed on wood, a bell sunk in the earth, are all of them non-elastics in a musical sense, though not philosophically so. When a solid body, such as a log of wood, is struck with a switch, only that part of it emits a sound which comes in contact with the switch; the note is acute and loud, but would be no less so though the adjacent parts of the log were removed. If, instead of the switch, a heavier or larger instrument is made use of, a larger portion of its surface then returns a sound, and the note is consequently more grave; but it would not be so, if the large instrument struck with a sharp edge, or a surface only equal to that of the small one.

In sounds of this kind, where there is only a single thwack, without any repetition, the immediate cause of the gravity or acuteness seems to be the quantity of air displaced by the sounding body; a large quantity of air displaced, produces a grave sound, and a smaller quantity a more acute one, the force wherewith the air is displaced signifying very little.—What we hear advance is confirmed by some experiments made by Dr Priestley, concerning the *musical tone* of electrical discharges. The passage being curious, and not very long, we shall here transcribe it:

"As the course of my experiments has required a great variety of electrical explosions, I could not help observing a great variety in the musical tone made by the reports. This excited my curiosity to attempt to reduce this variation to some measure. Accordingly, by the help of a couple of spinets, and two persons who had good ears for music, I endeavoured to ascertain the tone of some electrical discharges; and observed, that every discharge made several strings, particularly those that were chords to one another, to vibrate: but one note was always predominant, and sounded after the rest. As every explosion was repeated several times, and three of us separately took the same note, there remained no doubt but that the tone we fixed upon was at least very near the true one. The result was as follows:

"A jar containing half a square foot of coated glass sounded F sharp, concert pitch. Another jar of a different form, but equal surface, sounded the same.

"A jar of three square feet sounded C below F sharp. A battery consisting of sixty-four jars, each containing half a square foot, sounded F below the C.

"The same battery, in conjunction with another of thirty-one jars, sounded C sharp. So that a greater quantity of coated glass always gave a deeper note.

"Differences in the degree of a charge in the same jar made little or no difference in the tone of the explosion: if any, a higher charge gave rather a deeper note."

These experiments show us how much the gravity or acuteness of sounds depend on the quantity of air put in agitation by the sounding body. We know that the noise of the electric explosion arises from the return of the air into the vacuum produced by the electric flash. The larger the vacuum, the deeper was the note: for the same reason, the discharge of a musket produces a more acute note than that of a cannon; and thunder is deeper than either.

Besides this, however, other circumstances concur to produce different degrees of gravity or acuteness in sounds. The sound of a table struck upon with a piece of wood, will not be the same with that produced from a plate of iron struck by the same piece of wood, even if the blows should be exactly equal, and the iron perfectly kept from vibrating.—Here the sounds are generally said to differ in their degrees of acuteness, according to the specific gravities or densities of the substances which emit them. Thus gold, which is the most dense of all metals, returns a much graver sound than silver; and metalline wires, which are more dense than therms, return a proportionably greater sound.—But neither does this appear to be a general rule in which we can put confidence. Bell-metal is denser than copper, but it by no means appears to yield a graver sound; on the contrary, it seems very probable, that copper will give a graver sound than bell-metal, if both are struck upon in their non-elastic state; and we can by no means think that a bell of pure tin, the least dense of all the metals, will give a more acute sound than one of bell-metal, which is greatly more dense.—In some bodies hardness seems to have a considerable effect. Glass, which is considerably harder than any metal, gives a more acute sound; bell-metal is harder than gold, lead, or tin, and therefore sounds much more acutely; though how far this holds with regard to different substances, there are not a sufficient number of experiments for us to judge.

In bodies musically elastic, the whole substance vibrates with the slightest stroke, and therefore they always give the same note whether they are struck with a large or with a small instrument; so that striking a part of the surface of any body musically elastic is equivalent, in it, to striking the whole surface of a non-elastic one. If the whole surface of a table was struck with another table, the note produced would be neither more nor less acute whatever force was employed; because the whole surface would then yield a sound, and no force could increase the surface: the sound would indeed be louder in proportion to the force employed, but the gravity would remain the same. In like manner, when a bell, or musical string, is struck, the whole substance vibrates, and a greater stroke cannot increase the substance.—Hence we see the fallacy of what is said concerning the Pythagorean anvils. An anvil is a body musically elastic, and no difference in the tone can

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can be perceived whether it is ſtruck with a large, or with a ſmall hammer; becauſe either of them are ſufficient to make the whole ſubſtance vibrate, provided nothing but the anvil is ſtruck upon: ſmiths, however, do not ſtrike their anvils, but red-hot iron laid upon their anvils; and thus the vibrations of the anvil are ſtopped, ſo that it becomes a non-elaſtic body, and the differences of tone in the ſtrokes of different hammers proceed only from the ſurface of the large hammers covering the whole ſurface of the iron, or at leaſt a greater part of it than the ſmall ones. If the ſmall hammer is ſufficient to cover the whole ſurface of the iron as well as the large one, the note produced will be the ſame, whether the large or the ſmall hammer is uſed.

Laſtly, The argument for the preceding theory, grounded on the production of what are called *flute-notes* on the violin, is built on a falſe foundation; for the bow being lightly drawn on an open ſtring, produces no *flute-notes*, but only the harmonies of the note to which the ſtring is tuned. The *flute-notes* are produced by a particular motion of the bow, quick and near the bridge, and by fingering very gently. By this management, the ſame ſounds are produced, tho' at certain intervals only, as if the vibrations were transferred to the ſpace between the end of the finger-board and the finger, inſtead of that between the finger and the bridge. Why this ſmall part of the ſtring ſhould vibrate in ſuch a caſe, and not that which is under the immediate action of the bow, we muſt own ourſelves ignorant: nor dare we affirm that the vibrations really are transferred in this manner, only the ſame ſounds are produced as if they were.

Though theſe objections ſeem ſufficiently to overturn the foregoing theory, with regard to acute ſounds being the effects of weak ſtrokes, and grave ones of ſtronger impulſes, we cannot admit that longer or ſhorter vibrations are the occaſion of gravity or acuteneſs in ſound. A muſical ſound, however lengthened, either by ſtring or bell, is only a repetition of a ſingle one, whoſe duration by itſelf is but for a moment, and is therefore termed *inappretiable*, like the ſmack of a whip, or the exploſion of an electrical battery. The continuation of the ſound is nothing more than a repetition of this inſtantaneous inappretiable noiſe after the manner of an echo, and it is only this echo that makes the ſound agreeable. For this reaſon, muſic is much more agreeable when played in a large hall where the ſound is reverberated, than in a ſmall room where there is no ſuch reverberation. For the ſame reaſon, the ſound of a ſtring is more agreeable when put on a hollow violin than when faſtened to a plain board, &c.—In the ſound of a bell, we cannot avoid obſerving this echo very diſtinctly. The ſound appears to be made up of diſtinct pulſes, or repetitions of the ſame note produced by the ſtroke of the hammer. It can by no means be allowed, that the note would be more acute though theſe pulſes were to ſucceed one another more rapidly; the ſound would indeed become more ſimple, but would ſtill preſerve the ſame tone.—In muſical ſtrings the reverberations are vaſtly more quick than in bells; and therefore their ſound is more uniform or ſimple, and conſequently more agreeable than that of bells. In muſical glaſſes*, the vibrations muſt be inconceivably quicker than in any bell, or ſtringed inſtrument: and hence they are of all others

* See *Harmonica*.

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the moſt ſimple and the moſt agreeable, though neither the moſt acute nor the loudeſt.—As far as we can judge, quickneſs of vibration contributes to the uniformity, or ſimplicity, but not to the acuteneſs, nor to the loudneſs, of a muſical note.

It may here be objected, that each of the different pulſes, of which we obſerve the ſound of a bell to be compoſed, is of a very perceptible length, and far from being inſtantaneous; ſo that it is not fair to infer that the ſound of a bell is only a repetition of a ſingle inſtantaneous ſtroke, ſeeing it is evidently the repetition of a lengthened note.—To this it may be replied, that the inappretiable ſound which is produced by ſtriking a bell in a non-elaſtic ſtate, is the very ſame which, being firſt propagated round the bell, forms one of theſe ſhort pulſes that is afterwards re-echoed as long as the vibrations of the metal continue, and it is impoſſible that the quickneſs of repetition of any ſound can either increaſe or diminiſh its gravity.

Chap. II. *Of the propagation of Sound. Newton's Doctrine explained and vindicated.*

13 Propagation of ſound.

The writers on ſound have been betrayed into theſe difficulties and obſcurities, by rejecting the 47th propoſition, B. ii. of Newton, as inconcluſive reaſoning. Of this propoſition, however, the ingenious Mr Young of Trinity college, Dublin, has lately given a clear, explanatory, and able defence. He candidly owns that the demonſtration is obſcurely ſtated, and takes the liberty of varying, in ſome degree, from the method of Newton.

"1. The parts of all ſounding bodies, (he obſerves), vibrate according to the law of a cycloidal pendulum: for they may be conſidered as compoſed of an indefinite number of elaſtic fibres; but theſe fibres vibrate according to that law. *Vide Helſham, p.* 270.

"2. Sounding bodies propagate their motions on all ſides *in directum*, by ſucceſſive condenſations and rarefactions, and ſucceſſive goings forward and returnings backward of the particles. *Vide prop.* 43. *B.* 2. *Newton.*

"3. The pulſes are thoſe parts of the air which vibrate backwards and forwards; and which, by going forward, ſtrike (*pulſant*) againſt obſtacles. The latitude of a pulſe is the rectilineal ſpace through which the motion of the air is propagated during one vibration of the ſounding body.

"4. All pulſes move equally faſt. This is proved by experiment; and it is found that they deſcribe 1070 Paris feet, or 1142 London feet in a ſecond, whether the ſound be loud or low, grave or acute.

"5. Prob. To determine the latitude of a pulſe. Divide the ſpace which the pulſe deſcribes in a given time (4) by the number of vibrations performed in the ſame time by the ſounding body, (*cor.* 1. *prop.* 24. *Smith's Harmonics*), the quotient is the latitude.

"M. Sauveur, by ſome experiments on organ-pipes, found that a body, which gives the graveſt harmonic ſound, vibrates 12 times and a half in a ſecond, and that the ſhrilleſt ſounding body vibrates 51.100 times in a ſecond. At a medium, let us take the body which gives what Sauveur calls his *fixed ſound*: it performs 100 vibrations in a ſecond, and in the ſame time the pulſes deſcribe 1070 Pariſian feet; therefore the ſpace deſcribed by the pulſes whilſt the body vibrates once, that

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that is, the latitude or interval of the pulſe, will be 10.7 feet.

" 6. Prob. To find the proportion which the greateſt ſpace, through which the particles of the air vibrate, bears to the radius of a circle, whoſe perimeter is equal to the latitude of the pulſe.

" During the firſt half of the progreſs of the elaſtic fibre, or ſounding body, it is continually getting nearer to the next particle; and during the latter half of its progreſs, that particle is getting farther from the fibre, and theſe portions of time are equal (*Helſham*): therefore we may conclude, that at the end of the progreſs of the fibre, the firſt particle of air will be nearly as far diſtant from the fibre as when it began to move; and in the ſame manner we may infer, that all the particles vibrate through ſpaces nearly equal to that run over by the fibre.

" Now, M. Sauveur (*Acad. Science, an.* 1700, *p.* 141) has found by experiment, that the middle point of a chord which produces his *fixed ſound*, and whoſe diameter is $\frac{1}{5}$th of a line, runs over in its ſmalleſt ſenſible vibrations $\frac{1}{18}$th of a line, and in its greateſt vibrations 72 times that ſpace; that is $72\times\frac{1}{18}$th of a line, or 4 lines, that is, $\frac{1}{3}$d of an inch.

" The latitude of the pulſes of this fixed ſound is 10.7 feet (5); and ſince the circumference of a circle is to its radius as 710 is to 113, the greateſt ſpace deſcribed by the particles will be to the radius of a circle, whoſe periphery is equal to the latitude of the pulſe as $\frac{1}{3}$d of an inch is to 1.7029 feet, or 20.4348 inches, that is, as 1 to 61.3044.

" If the length of the ſtring be increaſed or diminiſhed in any proportion, *cæteris paribus*, the greateſt ſpace deſcribed by its middle point will vary in the ſame proportion. For the inflecting force is to the tending force as the diſtance of the ſtring from the middle point of vibration to half the length of the ſtring (*ſee Helſham and Martin*); and therefore the inflecting and tending forces being given, the ſtring will vibrate through ſpaces proportional to its length; but the latitude of the pulſe is inverſely as the number of vibrations performed by the ſtring in a given time, (5) that is, directly as the time of one vibration, or directly as the length of the ſtring (*prop.* 24. *cor.* 7. *Smith's Harmonics*); therefore the greateſt ſpace through which the middle point of the ſtring vibrates, will vary in the direct ratio of the latitude of the pulſe, or of the radius of a circle whoſe circumference is equal to the latitude, that is, it will be to that radius as 1 to 61.3044.

" 7. If the particles of the aërial pulſes, during any part of their vibration, be ſucceſſively agitated, according to the law of a cycloidal pendulum, the comparative elaſtic forces ariſing from their mutual action, by which they will afterwards be agitated, will be ſuch as will cauſe the particles to continue that motion, according to the ſame law, to the end of their vibration.

Plate I. fig. 7.

" Let AB, BC, CD, &c. denote the equal diſtances of the ſucceſſive pulſes; ABC the direction of the motion of the pulſes propagated from A towards B; E, F, G, three phyſical points of the quieſcent medium, ſituated in the right line AC at equal diſtances from each other; E*e*, F*f*, G*g* the very ſmall equal ſpaces through which theſe particles vibrate; $\epsilon, \varphi, \gamma$ any intermediate places of theſe points. Draw the right line PS equal to E*e*, biſect it in O, and from the centre O with the radius O P deſcribe the circle SIP*h*. Let the whole time of the vibration of a particle and its parts be denoted by the circumference of this circle and its proportional parts. And ſince the particles are ſuppoſed to be at firſt agitated according to the law of a cycloidal pendulum, if at any time PH, or PHS*h*, the perpendicular HL or *hl*, be let fall on PS, and if Eϵ be taken equal to PL or P*l*, the particle E ſhall be found in ϵ. Thus will the particle E perform its vibrations according to the law of a cycloidal pendulum. *Prop.* 52. *B.* 1. *Principia.*

" Let us ſuppoſe now, that the particles have been ſucceſſively agitated, according to this law, for a certain time, by any cauſe whatſoever, and let us examine what will be the comparative elaſtic forces ariſing from their mutual action, by which they will afterwards continue to be agitated.

" In the circumference PHS*h* take the equal arches HI, IK in the ſame ratio to the whole circumference which the equal right lines EF, FG have to BC the whole interval of the pulſes; and let fall the perpendiculars HL, IM, KN. Since the points E, F, G are ſucceſſively agitated in the ſame manner, and perform their entire vibrations of progreſs and regreſs while the pulſe is propagated from B to C, if PH be the time from the beginning of the motion of E, PI will be the time from the beginning of the motion of F, and PK the time from the beginning of the motion of G; and therefore Eϵ, Fφ, Gγ will be reſpectively equal to PL, PM, PN in the progreſs of the particles. Whence $\epsilon\varphi$ or EF+Fφ—Eϵ is equal to EF—LM. But $\epsilon\varphi$ is the expanſion of EF in the place $\epsilon\varphi$, and therefore this expanſion is to its mean expanſion as EF—LM to EF. But LM is to IH as IM is to OP, and IH is to EF as the circumference PHS*h* is to BC; that is, as OP is to V, if V be the radius of a circle whoſe circumference is BC; therefore, *ex æquo*, LM is to EF as IM is to V; and therefore the expanſion of EF in the place $\epsilon\varphi$ is to its mean expanſion as V—IM is to V; and the elaſtic force exiſting between the phyſical points E and F is to the mean elaſtic force as $\frac{1}{V-IM}$ is to $\frac{1}{V}$ (*Cotes Pneum. Lect.* 9.) By the ſame argument, the elaſtic force exiſting between the phyſical points F and G is to the mean elaſtic force as $\frac{1}{V-KN}$ is to $\frac{1}{V}$; and the difference between theſe forces is to the mean elaſtic force as $\frac{IM-KN}{V^2-V.IM-V.KN+IM.KN}$ is to $\frac{1}{V}$; that is, as $\frac{IM-KN}{V^2}$ is to $\frac{1}{V}$; or as IM—KN is to V; if only (upon account of the very narrow limits of the vibration) we ſuppoſe IM and KN to be indefinitely leſs than V. Wherefore, ſince V is given, the difference of the forces is as IM—KN, or as HL—IM (becauſe KH is biſected in I); that is, (becauſe HL—IM is to IH as OM is to OI or OP, and IH and OP are given quantities) as OM; that is, if F*f* be biſected in Ω as $\Omega\varphi$.

" In the ſame manner it may be ſhown, that if PHS*h* be the time from the beginning of the motion of E, PHS*i* will be the time from the beginning of the motion of F, and PHS*k* the time from the beginning of the

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the motion of G; and that the expansion of EF in the place $\varepsilon\varphi$ is to its mean expansion as $EF+F\varphi-E\varepsilon$, or as $EF+lm$ is to EF, or as $V+hl$ is to V in its regress; and its elastic force to the mean elastic force as $\frac{1}{V+hl}$ is to $\frac{1}{V}$; and that the difference of the elastic forces existing between E and F, and between F and G is to the mean elastic force as $kn-im$ is to V; that is, directly as $\Omega\tau$.

" But this difference of the elastic forces, existing between E and F, and between F and G, is the comparative elastic force by which the physical point φ is agitated: and therefore the comparative accelerating force, by which every physical point in the medium will continue to be agitated both in progress and regress, will be directly as its distance from the middle point of its vibration; and consequently, will be such as will cause the particles to continue their motion, undisturbed, according to the law of a cycloidal pendulum. *Prop.* 38. *l.* 1. *Newton.*

" Newton rejects the quantity $\mp V\times\overline{IM\mp KN}+IM\times KN$, on supposition that IM and KN are indefinitely less than V. Now, although this may be a reasonable hypothesis, yet, that this quantity may be safely rejected, will, I think, appear in a more satisfactory manner from the following considerations derived from experiment: PS, in its greatest possible state, is to V as 1 is to 61.3044 (6); and therefore IM or KN, in its greatest possible state, (that is, when the vibrations of the body are as great as possible, and the particle in the middle point of its vibration) is to V as 1 is to 122.6. Hence $V^2=15030.76$, $-V\times\overline{IM+KN}=245.2$ and $IM\times KN=1$; therefore V^2 is to $V^2-V\times\overline{IM+KN}+IM\times KN$ as 15.03076 is to 14786.56; that is, as 61 is to 60 nearly.

" Hence it appears, that the greatest possible error in the accelerating force, in the middle point, is the $\frac{1}{61}$st part of the whole. In other points it is much less; and in the extreme points the error entirely vanishes.

" We should also observe, that the ordinary sounds we hear are not produced by the greatest possible vibrations of which the sounding body is capable; and that in general IM and KN are nearly evanescent with respect to V. And very probably the disagreeable sensations we feel in very loud sounds, arise not only from IM or KN bearing a sensible proportion to V, by which means the cycloidal law of the pulses may be in some measure disturbed, but also from the very law of the motion of the sounding body itself being disturbed. For, the proof of this law's being observed by an elastic fibre is founded on the hypothesis that the space, through which it vibrates, is indefinitely little with respect to the length of the string. *See Smith's Harmonics, p.* 237, *Helsham, p.* 270.

" 8. If a particle of the medium be agitated, according to the law of a cycloidal pendulum, the comparative elastic force, acting on the adjacent particle, from the instant in which it begins to move, will be such as will cause it to continue its motion according to the same law.

" For let us suppose, that three particles of the medium had continued to move for times denoted by the arches PK, PI, PH, the comparative elastic force, acting on the second during the time of its motion, would have been denoted by HL—IM, that is, would have been directly as MO (7). And if this time be diminished till I becomes coincident with P, that is, if you take the particles in that state when the second is just beginning to move, and before the third particle has yet been set in motion; then the point M will fall on P, and MO become PO; that is, the comparative elastic force of the second particle, at the instant in which it begins to move, will be to the force with which it is agitated in any other moment of time, before the subsequent particle has yet been set in motion, directly as its distance from the middle point of vibration. Now this comparative elastic force, with which the second particle is agitated in the very moment in which it begins to move, arises from the preceding particle's approaching it according to the law of a pendulum; and therefore, if the preceding particle approaches it in this manner, the force by which it will be agitated, in the very moment it begins to move, will be exactly such as should take place in order to move it according to the law of a pendulum. It therefore sets out according to that law, and consequently the subsequent elastic forces, generated in every successive moment, will also continue to be of the just magnitude which should take place, in order to produce such a motion.

" 9. The pulses of the air are propagated from sounding bodies, according to the law of a cycloidal pendulum. The point E of any elastic fibre producing a sound, may be considered as a particle of air vibrating according to the law of a pendulum (1). This point E will therefore move according to this law for a certain time, denoted by the arch IH, before the second particle begins to move; for sound is propagated in time through the successive particles of air (4). Now from that instant, the comparative elastic force which agitates F, is (8) directly as its distance from the middle point of vibration. F therefore sets out with a motion according to the law of a pendulum: and therefore the comparative elastic force by which it will be agitated until G begins to move, will continue that law (8). Consequently F will approach G in the same manner as E approached F, and the comparative elastic force of G, from the instant in which it begins to move, will be directly as its distance from the middle point of vibration; and so on in succession. Therefore all the particles of air in the pulses successively set out from their proper places according to the law of a pendulum, and therefore (7) will finish their entire vibrations according to the same law.

Plate I. fig. 7.

" *Cor.* 1. The number of pulses propagated is the same with the number of vibrations of the tremulous body, nor is it multiplied in their progress: because the little physical line $\varepsilon\gamma$, (*fig.* 7.) as soon as it returns to its proper place, will there quiesce; for its velocity, which is denoted by the sine IM, then vanishes, and its density becomes the same with that of the ambient medium. This line, therefore, will no longer move, unless it be again driven forwards by the impulse of the sounding body, or of the pulses propagated from it.

" *Cor.* 2. In the extreme points of the little space through which the particle vibrates, the expansion of the air is in its natural state; for the expansion of the physical line is to its natural expansion as $V\mp IM$ is to

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to V; but IM is then equal to nothing. In the middle point of the progrefs the condenfation is greateft; for IM is then greateft, and confequently the expanfion V—IM leaft. In the middle of the regrefs, the rarefaction is greateft; for *im*, and confequently V+*im*, is then greateft.

"10. To find the velocity of the pulfes, the denfity and elaftic force of the medium being given.

"This is the 49th prop. B. 2. Newton, in which he fhows, that whilft a pendulum, whofe length is equal to the height of the homogeneous atmofphere, vibrates once forwards and backwards, the pulfes will defcribe a fpace equal to the periphery of a circle defcribed with that altitude as its radius.

"*Cor.* 1. He thence fhows, that the velocity of the pulfes is equal to that which a heavy body would acquire in falling down half the altitude of that homogeneous atmofphere; and therefore, that all pulfes move equally faft, whatever be the magnitude of PS, or the time of its being defcribed; that is, whether the tone be loud or low, grave or acute. See *Hales de Sonis*, § 49.

"*Cor.* 2. And alfo, that the velocity of the pulfes is in a ratio compounded of the direct fubduplicate ratio of the elaftic force of the medium, and the inverfe fubduplicate of its denfity. Hence founds move fomewhat fafter in fummer than in winter. See *Hales de Sonis*, p. 141.

"11. The ftrength of a tone is as the moment of the particles of air. The moment of thefe particles, (the medium being given) is as their velocity; and the velocity of thefe particles is as the velocity of the ftring which fets them in motion (9). The velocities of two different ftrings are equal when the fpaces which they defcribe in their vibrations are to each other as the times of thefe vibrations: therefore, two different tones are of equal ftrength, when the fpaces, through which the ftrings producing them vibrate, are directly as the times of their vibration.

2d Plate II.

"12. Let the ftrength of the tones of the two ftrings AB, CD, which differ in tenfion only (fig. 1, 2.) be equal. Quere the ratio of the inflecting forces F and *f*. From the hypothefis of the equality of the ftrength of the tones, it follows (11), that the fpace GE muft be to the fpace HF as $f^{\frac{1}{2}}$ to $F^{\frac{1}{2}}$, (*Smith's Harm. Prop.* 24. *Cor.* 4.) Now the forces inflecting AB, CD through the equal fpaces GE, HP are to each other as the tending forces, that is, as F to *f*, (*Malcolm's Treatife on Mufic, p.* 52.) But the force inflecting CD through HP is to the force inflecting it through HF as HP or GE to HF, (*ib. p.* 47.) that is, by the hyp. as $f^{\frac{1}{2}}$ to $F^{\frac{1}{2}}$. Therefore, *ex æquo*, the forces inflecting AB and CD, when the tones are equally ftrong, are to each other as $F \times f^{\frac{1}{2}}$ to $f \times F^{\frac{1}{2}}$, or as $F^{\frac{1}{2}}$ to $f^{\frac{1}{2}}$. That is, the forces neceffary to produce tones of equal ftrength in various ftrings which differ only in tenfion, are to each other in the fubduplicate ratio of the tending forces, that is, inverfely as the time of one vibration, or directly as the number of vibrations performed in a given time. Thus, if CD be the acute octave to AB, its tending force will be quadruple that of AB, (*Malcolm's Treatife on Mufic, p.* 53); and therefore to produce tones of equal ftrength in thefe ftrings, the force impelling CD muft be double that impelling AB; and fo in other cafes.

"Suppofe, now, that the ftrings AB, CD, (fig. 2, 3.) differ in length only. The force inflecting AB through GE is to the tending force, which is given, as GE to AG; and this tending force is to the force inflecting CD through the fpace HP equal to GE, as HD to HP. Therefore, *ex æquo*, the forces inflecting AB and CD through the equal fpaces GE and HP, are to each other as HD to AG, or as CD to AB. But the force inflecting CD through HP is to the force inflecting it through HF, as HP or GE to HF, that is, becaufe thefe fpaces are as the times (11), as AB to CD. Therefore, *ex æquo*, the forces inflecting AB and CD, when the tones are equally ftrong, are to each other in a ratio of equality. Hence we fhould fuppofe, that in this cafe, an equal number of equal impulfes would generate equally powerful tones in thefe ftrings. But we are to obferve, that the longer the ftring, the greater, *cæteris paribus*, is the fpace through which a given force inflects it (*Malcolm*); and therefore whatever diminution is produced in the fpaces through which the ftrings move in their fucceffive vibrations, arifing either from the want of perfect elafticity in the ftrings, or from the refiftance of the air, this diminution will bear a greater proportion to the lefs fpace, through which the fhorter ftring vibrates. And this is confirmed by experience; for we find that the duration of the tone and motion of the whole ftring exceeds that of any of its fubordinate parts. Therefore, after a given interval of time, a greater quantity of motion will remain in the longer ftring; and confequently, after the fucceffive equal impulfes have been made, a greater degree of motion will ftill fubfift in it. That is, a given number of equal impulfes being made on various ftrings differing in length only, a ftronger found will be produced in that which is the longer."

Chap. III. *Of the Velocity*, &c. *of Sound. Axioms.*

Experience has taught us, that found travels at about the rate of 1142 feet in a fecond, or near 13 miles in a minute; nor do any obftacles hinder its progrefs, a contrary wind only a fmall matter diminifhing its velocity. 14 Velocity of found.

The method of calculating its progrefs is eafily made known. When a gun is difcharged at a diftance, we fee the fire long before we hear the found. If then we know the diftance of the place, and know the time of the interval between our firft feeing the fire and then hearing the report, this will fhow us exactly the time the found has been travelling to us. 15 Its progrefs calculated. For inftance, if the gun is difcharged a mile off, the moment the flafh is feen, you take a watch and count the feconds till you hear the found; the number of feconds is the time the found has been travelling a mile.—Again, by the above axiom, we are enabled to find the diftance between objects that would be otherwife immeafurable. For example, fuppofe you fee the flafh of a gun in the night at fea, and tell feven feconds before you hear the report, it follows therefore, that the diftance is feven times 1142 feet, that is, 24 yards more than a mile and a half. 16 Diftances calculated by means of found. In like manner, if you obferve the number of feconds between the lightning and the report of the thunder, you know the diftance of the cloud from whence it proceeds.

Derham has proved by experience, that all founds whatever travel at the fame rate. The found of a gun, 17. All founds travel at the fame rate.

and

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and the ſtriking of a hammer, are equally ſwift in their motions; the ſofteſt whiſper flies as ſwiftly, as far as it goes, as the loudeſt thunder.

To theſe axioms we may add the following.

18 Smooth and clear ſounds proceed from bodies that are homogeneous, and of an uniform figure; and harſh or obtuſe ſounds, from ſuch as are of a mixed matter and irregular figure.

19 The velocity of ſound is to that of a briſk wind as fifty to one.

20 The ſtrength of ſounds is greateſt in cold and denſe air, and leaſt in that which is warm and rarefied.

21 Every point againſt which the pulſes of ſound ſtrike, becomes a centre from which a new ſeries of pulſes are propagated in every direction.

22 Sound deſcribes equal ſpaces in equal times.

Chap. IV. *Of Reverberated Sounds.*

23 Sound, like light, after it has been reflected from ſeveral places, may be collected in one point, as into a focus; and it will be there more audible than in any other part, even than at the place from whence it proceeded. On this principle it is that a whiſpering gallery is conſtructed.

24 Whiſpering Gallery, Plate I. fig. 3.

The form of this gallery muſt be that of a concave hemiſphere (E), as ABC; and if a low ſound or whiſper be uttered at A, the vibrations expanding themſelves every way will impinge on the points DDD, &c. and from thence be reflected to EEE, and from thence to the points F and G, till at laſt they all meet in C, where, as we have ſaid, the ſound will be the moſt diſtinctly heard.

25 Speaking-trumpet, fig. 4.

The augmentation of ſound by means of ſpeaking-trumpets, is uſually illuſtrated in the following manner: Let ABC be the tube, BD the axis, and B the mouth-piece for conveying the voice to the tube. Then it is evident, when a perſon ſpeaks at B in the trumpet, the whole force of his voice is ſpent upon the air contained in the tube, which will be agitated through the whole length of the tube; and, by various reflections from the ſide of the tube to the axis, the air along the middle part of the tube will be greatly condenſed, and its *momentum* proportionably increaſed, ſo that when it comes to agitate the air at the orifice of the tube AC, its force will be as much greater than what it would have been without the tube, as the ſurface of a ſphere, whoſe radius is equal to the length of the tube, is greater than the ſurface of the ſegment of ſuch a ſphere whoſe baſe is the orifice of the tube. For a perſon ſpeaking at B, without the tube, will have the force of his voice ſpent in exciting concentric ſuperficies of air all around the point B; and when thoſe ſuperficies or pulſes of air are diffuſed as far as D every way, it is plain the force of the voice will there be diffuſed through the whole ſuperficies of a ſphere whoſe radius is BD; but in the trumpet it will be ſo confined, that at its exit it will be diffuſed through ſo much of that ſpherical ſurface of air as correſponds to the orifice of the tube. But ſince the force is given, its intenſity will be always inverſely as the number of particles it has to move; and therefore in the tube it will be to that without, as the ſuperficies of ſuch a ſphere to the æra of the large end of the tube nearly.

But it is obvious, Mr Young obſerves, that the confinement of the voice can have little effect in increaſing the ſtrength of the ſound, as this ſtrength depends on the velocity with which the particles move. Were this reaſoning concluſive, the voice ſhould iſſue through the ſmalleſt poſſible orifice; cylindrical tubes would be preferable to any that increaſed in diameter; and the leſs the diameter, the greater would be the effect of the inſtrument; becauſe the plate or maſs of air to be moved, would, in that caſe, be leſs, and conſequently the effect of the voice the greater; all which is contradicted by experience.

The cauſe of the increaſe of ſound in theſe tubes muſt therefore be derived from ſome other principles: and amongſt theſe we ſhall probably find, that what the ingenious Kircher has ſuggeſted in his Phonurgia is the moſt deſerving of our attention. He tells us, that "the augmentation of the ſound depends on its reflection from the tremulous ſides of the tube; which reflections, conſpiring in propagating the pulſes in the ſame direction, muſt increaſe its intenſity." Newton alſo ſeems to have conſidered this as the principal cauſe, in the ſcholium of prop. 50. B. 2. Princip. when he ſays, "we hence ſee why ſounds are ſo much increaſed in ſtentorophonic tubes, for every reciprocal motion is, in each return, increaſed by the generating cauſe.

Farther, when we ſpeak in the open air, the effect on the tympanum of a diſtant auditor is produced merely by a ſingle pulſe. But when we uſe a tube, all the pulſes propagated from the mouth, except thoſe in the direction of the axis, ſtrike againſt the ſides of the tube, and every point of impulſe becoming a new centre, from whence the pulſes are propagated in all directions, a pulſe will arrive at the ear from each of thoſe points; thus, by the uſe of a tube, a greater number of pulſes are propagated to the ear, and conſequently the ſound increaſed. The confinement too of the voice may have ſome effect, though not ſuch as is aſcribed to it by ſome; for the condenſed pulſes produced by the naked voice, freely expand every way; but in tubes, the lateral expanſion being diminiſhed, the direct expanſion will be increaſed, and conſequently the velocity of the particles, and the intenſity of the ſound. The ſubſtance alſo of the tube has its effect; for it is found by experiment, that the more elaſtic the ſubſtance of the tube, and conſequently the more ſuſceptible it is of theſe tremulous motions, the ſtronger is the ſound.

If the tube be laid on any non-elaſtic ſubſtance, it deadens the ſound, becauſe it prevents the vibratory motion of the parts. The ſound is increaſed in ſpeaking-trumpets, if the tube be ſuſpended in the air; becauſe the agitations are then carried on without interruption. Theſe tubes ſhould increaſe in diameter from the mouth-piece, becauſe the parts, vibrating in directions perpendicular to the ſurface, will conſpire in impelling forward the particles of air, and conſequently, by increaſing their velocity, will increaſe the intenſity of the ſound: and the ſurface alſo increaſing, the number of points of impulſe and of new propagations will increaſe pro-

(E) A cylindric or elliptic arch will anſwer ſtill better than one that is circular.

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proportionally. The ſeveral cauſes, therefore, of the increaſe of ſound in theſe tubes, Mr Young concludes to be, 1. The diminution of the lateral, and conſequently the increaſe of the direct, expanſion and velocity of the included air. 2. The increaſe of the number of pulſes, by increaſing the points of new propagation. 3. The reflections of the pulſes from the tremulous ſides of the tube, which impel the particles of air forward, and thus increaſe their velocity.

26 Echoes.

An echo is a reflection of ſound ſtriking againſt ſome object, as an image is reflected in a glaſs: but it has been diſputed what are the proper qualities in a body for thus reflecting ſounds. It is in general known, that caverns, grottoes, mountains, and ruined buildings, return this image of ſound. We have heard of a very extraordinary echo, at a ruined fortreſs near Louvain, in Flanders. If a perſon ſung, he only heard his own voice, without any repetition: on the contrary, thoſe who ſtood at ſome diſtance, heard the echo but not the voice; but then they heard it with ſurpriſing variations, ſometimes louder, ſometimes ſofter, now more near, then more diſtant. There is an account in the memoirs of the French academy, of a ſimilar echo near Rouen.

As (by n° 21 and 22) every point againſt which the pulſes of ſound ſtrike becomes the centre of a new ſeries of pulſes, and ſound deſcribes equal diſtances in equal times; therefore, when any ſound is propagated from a ceutre, and its pulſes ſtrike againſt a varicty of obſtacles, if the ſum of the right lines drawn from that point to each of the obſtacles, and from each obſtacle to a ſecond point, be equal, then will the later be a point in which an echo will be heard. "Thus let A be the point from which the ſound is propagated in all directions, and let the pulſes ſtrike againſt the obſtacles C, D, E, F, G, H, I, &c. each of theſe points becomes a new centre of pulſes by the firſt principle, and therefore from each of them one ſeries of pulſes will paſs through the point B. Now if the ſeveral ſums of the right lines $\overline{AC+CB}$, $\overline{AD+DB}$, $\overline{AE+EB}$, $\overline{AG+GB}$, $\overline{AH+HB}$, $\overline{AI+IB}$, &c. be all equal to each other, it is obvious that the pulſes propagated from A to theſe points, and again from theſe points to B, will all arrive at B at the ſame inſtant, according to the ſecond principle; and therefore, if the hearer be in that point, his ear will at the ſame inſtant be ſtruck by all theſe pulſes. Now it appears from cxperiment (*ſee Muſſchenbroek*, *V.* ii. *p.* 210), that the ear of an exerciſed muſician can only diſtinguiſh ſuch ſounds as follow one another at the rate of 9 or 10 in a ſecond, or any ſlower rate: and therefore, for a diſtinct perception of the direct and reflected ſound, therc ſhould intervene the interval of $\frac{1}{9}$th of a ſecond; but in this time ſound deſcribes $\frac{1142}{9}$ or 127 feet nearly. And therefore, unleſs the ſum of the lines drawn from each of the obſtacles to the points A and B exceeds the interval AB by 127 feet, no echo will be heard at B. Since the ſeveral ſums of the lines drawn from the obſtacles to the points A and B are of the ſame magnitude, it appears that the curve paſſing through all the points C, D, E, F, G, H, I, &c. will be an ellipſe, (*prop.* 14. *B.* 2. *Ham. Con.*) Hence all the points of the obſtacles which produce an echo, muſt lie in the ſurface of the oblong ſphæroid, generated by the revolution of this ellipſe round its major axis.

"As there may be ſeveral ſphæroids of different magnitudes, ſo there may be ſeveral different echoes of the ſame original ſound. And as there may happen to be a greater number of reflecting points in the ſurface of an exterior ſphæroid than in that of an interior, a ſecond or a third echo may be much more powerful than the firſt, provided that the ſuperior number of reflecting points, that is, the ſuperior number of reflected pulſes propagated to the ear, be more than ſufficient to compenſate for the decay of ſound which ariſes from its being propagated through a greater ſpace. This is finely illuſtrated in the celebrated echoes at the lake of Killarney in Kerry, where the firſt return of the ſound is much inferior in ſtrength to thoſe which immediately ſucceed it.

"From what has been laid down it appears, that for the moſt powerful echo, the ſounding body ſhould be in one focus of the ellipſe which is the ſection of the echoing ſphæroid, and the hearer in the other. However, an echo may be heard in other ſituations, though not ſo favourably; as ſuch a number of reflected pulſes may arrive at the ſame time at the ear as may be ſufficient to excite a diſtinct perception. Thus a perſon often hears the echo of his own voice; but for this purpoſe he ſhould ſtand at leaſt 63 or 64 feet from the reflecting obſtacle, according to what has been ſaid before. At the common rate of ſpeaking, we pronounce not above three ſyllables and an half, that is, ſeven half ſyllables in a ſecond; therefore, that the echo may return juſt as ſoon as three ſyllables are expreſſed, twice the diſtance of the ſpeaker from the reflecting object muſt be equal to 1000 feet; for, as ſound deſcribes 1142 feet in a ſecond, $\frac{6}{7}$ths of that ſpace, that is, 1000 feet nearly, will be deſcribed while ſix half or three whole ſyllables are pronounced: that is, the ſpeaker muſt ſtand near 500 feet from the obſtacle. And in general, the diſtance of the ſpeaker from the echoing ſurface, for any number of ſyllables, muſt be equal to the ſeventh part of the product of 1142 feet multiplied by that number.

"In churches we never hear a diſtinct echo of the voice, but a confuſed ſound when the ſpeaker utters his words too rapidly; becauſe the greateſt difference of diſtance between the direct and reflected courſes of ſuch a number of pulſes as would produce a diſtinct ſound, is never in any church equal to 127 feet, the limit of echos.

"But though the firſt reflected pulſes may produce no echo, both on account of their being too few in number, and too rapid in their return to the ear; yet it is evident, that the reflecting ſurface may be ſo formed, as that the pulſes which come to the ear after two reflections or more may, after having deſcribed 127 feet or more, arrive at the ear in ſufficient numbers, and alſo ſo nearly at the ſame inſtant, as to produce an echo, though the diſtance of the reflecting ſurface from the ear be leſs than the limit of echoes. This is confirmed by a ſingular echo in a grotto on the banks of the little brook called the Dinan, about two miles from Caſtlecomber, in the county of Kilkenny. As you enter the cave, and continue ſpeaking loud, no return of the voice is perceived; but on your arriving at

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a certain point, which is not above 14 or 15 feet from the reflecting surface, a very distinct echo is heard. Now this echo cannot arise from the first course of pulses that are reflected to the ear, because the breadth of the cave is so small, that they would return too quickly to produce a distinct sensation from that of the original sound: it therefore is produced by those pulses, which, after having been reflected several times from one side of the grotto to the other, and having run over a greater space than 127 feet, arrive at the ear in considerable numbers, and not more distant from each other, in point of time, than the ninth part of a second."

This article shall be dismissed with a few inventions founded on some of the preceding principles, which may amuse a number of our readers.

Entertaining Experiments and Contrivances.

27 I. The Conversive Statue, Plate I. fig. 5.

I. PLACE a concave mirror of about two feet diameter, as A B (G), in a perpendicular direction. The focus of this mirror may be at 15 or 18 inches distance from its surface. At the distance of about five or six feet let there be a partition, in which there is an opening E F, equal to the size of the mirror; against this opening must be placed a picture, painted in water-colours, on a thin cloth, that the sound may easily pass through it (H).

Behind the partition, at the distance of two or three feet, place another mirror G H, of the same size as the former, and let it be diametrically opposite to it.

At the point C let there be placed the figure of a man seated on a pedestal, and let his ear be placed exactly in the focus of the first mirror: his lower jaw must be made to open by a wire, and shut by a spring; and there may be another wire to move the eyes: these wires must pass through the figure, go under the floor, and come up behind the partition.

Let a person, properly instructed, be placed behind the partition near the mirror. You then propose to any one to speak softly to the statue, by putting his mouth to the ear of it, assuring him that it will answer instantly. You then give the signal to the person behind the partition, who, by placing his ear to the focus I, of the mirror G H, will hear distinctly what the other said; and, moving the jaw and eyes of the statue by the wires, will return an answer directly, which will in like manner be distinctly heard by the first speaker.

This experiment appears to be taken from the Century of Inventions of the Marquis of Worcester; whose designs, at the time they were published, were treated with ridicule and neglect as being impracticable, but are now known to be generally, if not universally practicable. The words of the Marquis are these: "How to make a brazen or stone head in the midst of a great field or garden, so artificial and natural, that though a man speak ever so softly, and even whisper into the ear thereof, it will presently open its mouth, and resolve the question in French, Latin, Welsh, Irish, or English, in good terms, uttering it out of its mouth, and then shut it until the next question be asked."—The two following, of a similar nature, appear to have been inventions of Kircher, by means of which (as he informs us *) he used to "utter feigned and ludicrous consultations, with a view to show the fallacy and imposture of ancient oracles."

* *Phonurgia Nova*, sect. vi. c. 1.

28 The Communicative Busts.

II. LET there be two heads of plaster of Paris, placed on pedestals, on the opposite sides of a room. There must be a tin tube of an inch diameter, that must pass from the ear of one head, through the pedestal, under the floor, and go up to the mouth of the other. Observe, that the end of the tube which is next the ear of the one head, should be considerably larger than that end which comes to the mouth of the other. Let the whole be so disposed that there may not be the least suspicion of a communication.

Now, when a person speaks, quite low, into the ear of one bust, the sound is reverberated thro' the length of the tube, and will be distinctly heard by any one who shall place his ear to the mouth of the other. It is not necessary that the tube should come to the lips of the bust.—If there be two tubes, one going to the ear, and the other to the mouth, of each head, two persons may converse together, by applying their mouth and ear reciprocally to the mouth and ear of the busts; and at the same time other persons that stand in the middle of the chamber, between the heads, will not hear any part of their conversation.

29 The Oracular Head.

III. PLACE a bust on a pedestal in the corner of a room, and let there be two tubes, as in the foregoing amusement, one of which must go from the mouth and the other from the ear of the bust, through the pedestal, and the floor, to an under apartment. There may be likewise wires that go from the under jaw and the eyes of the bust, by which they may be easily moved.

A person being placed in the under room, and at a signal given applying his ear to one of the tubes, will hear any question that is asked, and immediately reply; moving at the same time, by means of the wires, the mouth and the eyes of the bust, as if the reply came from it.

30 A Solar Sonata.

IV. IN a large case, such as is used for dials and spring-clocks, the front of which, or at least the lower part of it, must be of glass, covered on the inside with gauze, let there be placed a barrel-organ, which, when wound up, is prevented from playing, by a catch that takes a toothed wheel at the end of the barrel. To one end of this catch there must be joined a wire, at the end of which there is a flat circle of cork, of the same dimension with the inside of a glass tube, in which it is to rise and fall. This tube must communicate with a reservoir that goes across the front part of the bottom of the case, which is to be filled with spirits, such as is used in ther-

(G) Both the mirrors here used may be of tin or gilt pasteboard, this experiment not requiring such as are very accurate.

(H) The more effectually to conceal the cause of this allusion, the mirror AB may be fixed in the wainscot, and a gauze or any other thin covering thrown over it, as that will not in the least prevent the sound from being reflected. An experiment of this kind may be performed in a field or garden, between two hedges, in one of which the mirror AB may be placed, and in the other an opening artfully contrived.

Entertaining Experiments, &c.

thermometers, but not coloured, that it may be the better concealed by the gauze.

This case being placed in the sun, the spirits will be rarefied by the heat; and rising in the tube, will lift up the catch or trigger, and set the organ in play: which it will continue to do as long as it is kept in the sun; for the spirits cannot run out of the tube, that part of the catch to which the circle is fixed being prevented from rising beyond a certain point by a check placed over it.

When the machine is placed against the side of a room on which the sun shines strong, it may constantly remain in the same place, if you inclose it in a second case, made of thick wood, and placed at a little distance from the other. When you want it to perform, it will be only necessary to throw open the door of the outer case, and expose it to the sun.

But if the machine be moveable, it will perform in all seasons by being placed before the fire; and in the winter it will more readily stop when removed into the cold.

A machine of this sort is said to have been invented by Cornelius Dreble, in the last century. What the construction of that was, we know not; it might very likely be more complex, but could scarce answer the intention more readily.

31 Automatous Harpsichord.

V. Under the keys of a common harpsichord let there be fixed a barrel, something like that in a chamber organ, with stops or pins corresponding to the tunes you would have it play. These stops must be moveable, so that the tunes may be varied at pleasure. From each of the keys let there go a wire perpendicular down: the ends of these wires must be turned up for about one-fourth of an inch. Behind these wires let there be an iron bar, to prevent them from going too far back. Now, as the barrel turns round, its pins take the ends of the wires, which pull down the keys, and play the harpsichord. The barrel and wires are to be all inclosed in a case.

In the chimney of the same room where the harpsichord stands, or at least in one adjacent, there must be a smoke jack, from whence comes down a wire, or cord, that, passing behind the wainscot adjoining the chimney, goes under the floor, and up one of the legs of the harpsichord, into the case, and round a small wheel fixed on the axis of that first mentioned. There should be pullies at different distances, behind the wainscot and under the floor, to facilitate the motion of the chord.

This machinery may be applied to any other keyed instrument as well as to chimes, and to many other purposes where a regular continued motion is required.

An instrument of this sort may be considered as a perpetual motion, according to the vulgar acceptation of the term; for it will never cease going till the fire be extinguished, or some parts of the machinery be worn out.

32 A Ventosal Symphony, Plate I. fig. 6.

VI. At the top of a summer-house, or other building, let there be fixed a vane AB, on which is the pinion C, that takes the toothed wheel D, fixed on the axis EF, which at its other end carries the wheel G, that takes the pinion H. All these wheels and pinions are to be between the roof and the ceiling of the building. The pinion H is fixed to the perpendicular axis IK, which goes down very near the wall of the room, and may be covered after the same manner as are bell-wires. At the lower end of the axis IK there is a small pinion L, that takes the wheel M, fixed on the axis of the great wheel NO. In this wheel there must be placed a number of stops, corresponding to the tunes it is to play. These stops are to be moveable, that the tunes may be altered at pleasure. Against this wheel there must hang 12 small bells, answering to the notes of the gamut. Therefore, as the wheel turns round, the stops striking against the bells, play the several tunes. There should be a fly to the great wheel, to regulate its motion when the wind is strong. The wheel NO, and the bells, are to be inclosed in a case.

There may be several sets of bells, one of which may answer to the tenor, another to the treble, and a third to the bass; or they may play different tunes, according to the size of the wheel. As the bells are small, if they are of silver, their tone will be the more pleasing.

Instead of bells, glasses may be here used, so disposed as to move freely at the stroke of the stops. This machinery may likewise be applied to a barrel-organ; and to many other uses.

Acqs || Acqui.

ACQS, a town at the foot of the Pyrenæan mountains, in the government of Foix in France. It takes its name from the hot waters in these parts. E. long. 1. 40. lat. 43. 0.

ACQUAPENDENTE, a pretty large town of Italy, in the territory of the church, and patrimony of St Peter, with a bishop's see. It is seated on a mountain, near the river Paglia, ten miles W. of Orvietto, and 57 N. by W. of Rome. E. long. 11. 53. Lat. 42. 43.

ACQUARIA, a small town of Italy, in Frigana, a district of Modena, which is remarkable for its medicinal waters. It is 12 miles south of the city of Modena. E. long. 11. 17. Lat. 44. 24.

ACQUEST, or Acquist, in law, signifies goods got by purchase or donation. See Conquest.

ACQUI, a town of Italy, in the duchy of Montferrat, with a bishop's see, and commodious baths. It was taken by the Spaniards in 1745, and retaken by the Piedmontese in 1746; but after this, it was taken again and dismantled by the French, who afterwards forsook it. It is seated on the river Bornio, 25 miles N. W. of Genoa, and 30 S. of Casal. E. long. 8. 30. Lat. 44. 40.

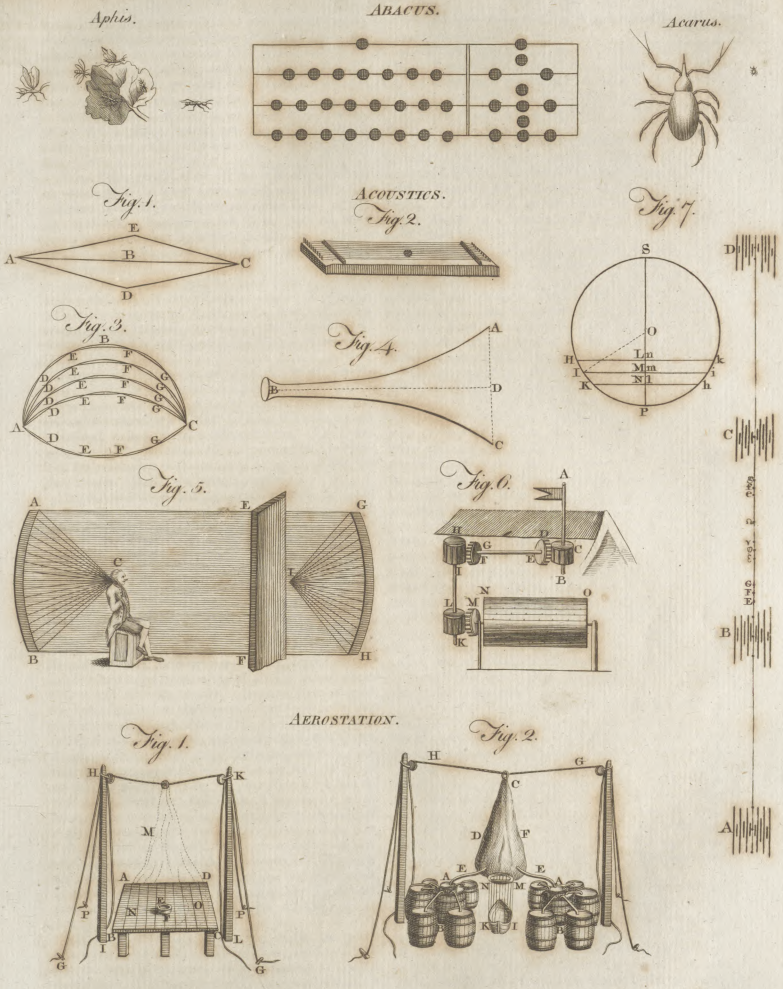
A C Q

Acquisition || Acquittance.

ACQUISITION, in general, denotes the obtaining or procuring something. Among lawyers, it is used for the right or title to an estate got by purchase or donation.

ACQUITTAL, a discharge, deliverance, or setting of a person free from the guilt or suspicion of an offence.

ACQUITTANCE, a release or discharge in writing for a sum of money, witnessing that the party has paid the said sum.—No man is obliged to pay a sum of money



A. Bell PRIN. WAL. SCULPTOR fecit.

money if the demandant refuſes to give an acquittance, which is a full diſcharge, and bars all actions, &c. An acquittance given by a ſervant for a ſum of money received for the uſe of his maſter, ſhall be a good diſcharge for that ſum, provided the ſervant uſed to receive his maſter's rents, debts, &c.

ACRA, a town of Africa, on the coaſt of Guinea, where the Engliſh, Dutch, and Danes, have ſtrong forts, and each fort its particular village. W. long. 0. 2. Lat. 5. 0.

Acra (anc. geog.), one of the hills of Jeruſalem, on which ſtood the lower town, which was the Old Jeruſalem; to which was afterwards added Zion, or the city of David. Probably called *Acra*, from the fortreſs which Antiochus built there in order to annoy the temple, and which Simon Maccabæus took and razed to the ground.

Acra Japygia (anc. geog.), called *Salentia* by Ptolemy; now *Capo di San Maria di Leuca:* A promontory in the kingdom of Naples, to the ſouth-eaſt of Otranto, where formerly was a town, now lying in ruins, on the Ionian ſea, over againſt the Montes Acroceraunii of Epirus.

Acræ (anc. geog.), a town of Sicily, whoſe inhabitants were called *Acrenſes.* It ſtood to the ſouth of Syracuſe at the diſtance of 24 miles, near the place now called the monaſtery of *Santa Maria d'Arcia*, on an eminence, as appears from Silius Italicus. The Syracuſans were the founders of it, according to Thucydides, 70 years after the building of Syracuſe, or 665 before Chriſt. Hence the epithet *Acræus.*

ACRAGAS, or Agragas (anc. geog.), ſo called by the Greeks, and ſometimes by the Romans, but more generally *Agrigentum* by the latter; a town of Sicily. In Greek medals the inhabitants are called ΑΚΡΙΓΑΝΤΙΝΟΙ, and *Agrigentini* by Cicero. The town ſtood upon a mountain, at the confluence of the Acragas and Hypſa, near the port called Εμποριον by Ptolemy, but Επινειον, or the Dock, by Strabo; and in the time of the latter, ſcarce a trace of all that ſide remained. In the year before Chriſt 584, the people of Gela built Acragas, 108 years after building their own city. It took its name from the river running by it; and being but two miles from, enjoyed all the conveniences that ſhould come by, the ſea. It was a place of great ſtrength, ſtanding on the top of a very ſteep rock, and waſhed on the ſouth ſide by the river Acragas, now called *Fiume di Gergenti*, and on the ſouth-weſt by the Hypſa, with a citadel to the ſouth-eaſt, externally ſurrounded by a deep gulf, which made it inacceſſible but on the ſide next the town. It was famous for the tyrant Phalaris and his brazen bull. They were a people luxurious in their tables, and magnificent in their dwellings; of whom Empedocles, in Diogenes Laertius, ſays, that they lived to-day as if they were to die to-morrow, and built as if they were to live for ever. The country round the city was laid out in vine and olive yards, in the produce of which they carried on a great and profitable commerce with Carthage. E. long. 13. 30. Lat. 37. 20.

ACRASIA, among phyſicians, implies the predominancy of one quality above another, either with regard to artificial mixtures, or the humours of the human body. The word is Greek, and compounded of α, priv. and κεροννυμι, to *mix*; q. d. not mixed in a juſt proportion.

ACRATH (anc. geog.), a place in Mauritania Tingitana, now ſuppoſed to be *Velez de Gomara:* A fortified town in the kingdom of Fez, with a citadel and commodious harbour on the Mediterranean, ſcarce a mile diſtant from Penon de Velez, a Spaniſh fort. W. long. 5. lat. 34. 45.

ACRE, or Acra, a ſea-port town in Syria. It was formerly called *Ptolemais*, and is a biſhop's ſee. It was very famous in the time of the cruſadoes, and underwent ſeveral ſieges both by the Chriſtians and Saracens. It is ſituated at the north angle of a bay, which extends in a ſemicircle of three leagues, as far as the point of Carmel.

During the cruſades, the poſſeſſion of this town was long diſputed by the Chriſtians and Saracens. In 1192 it was taken from the latter by Richard I. of England and Philip of France, who gave it to the knights of St John of Jeruſalem, who kept poſſeſſion of it 100 years, when it was retaken by the Saracens, and almoſt entirely deſtroyed. This event is rendered memorable by an act of ſingular reſolution with which it was accompanied. A number of beautiful young nuns, terrified at the proſpect of being expoſed to the brutal luſt of the infidels, determined to avoid the violation of their chaſtity, by rendering themſelves objects of averſion. With this view they cut off their noſes and mangled their faces. The Saracens, inflamed with reſentment at a ſpectacle which prevented the gratification of their appetites, immediately put them all to the ſword. After the expulſion of the cruſaders, it remained almoſt deſerted; but in our time has again revived by the induſtry of Daher; and the works erected by Djezzar, within the laſt ten years, have rendered it one of the principal towns upon the coaſt. The moſque of this Pacha is boaſted as a maſterpiece of eaſtern taſte. The bazar, or covered market, is not inferior even to thoſe of Aleppo; and its public fountain ſurpaſſes in elegance thoſe of Damaſcus, though the water is of a very indifferent quality. The Pacha has derived the more honour from theſe works, as he was himſelf both the engineer and architect: he formed the plans, drew the deſigns, and ſuperintended the execution.

The port of Acre is one of the beſt ſituated on the coaſt, as it is ſheltered from the north and north-weſt winds by the town itſelf; but it is greatly choaked up ſince the time of Fakr-el-din. Djezzar has contented himſelf with making a landing-place for boats. The fortifications, though more frequently repaired than any other in all Syria, are of no importance: there are only a few wretched low towers, near the port, on which cannon are mounted; and theſe ruſty iron pieces are ſo bad, that ſome of them burſt every time they are fired. Its defence on the land ſide is merely a garden-wall, without any ditch.

Corn and cotton form the baſis of the commerce of Acre, which is becoming more flouriſhing every day. Of late, the Pacha, by an abuſe common throughout all the Turkiſh empire, has monopolized all the trade in his own hands; no cotton can be ſold but to him, and from him every purchaſe muſt be made. In vain have the European merchants claimed the privileges

Acre.

granted them by the Sultan; Djezzar replied, that he was the Sultan in his country, and continued his monopoly. These merchants in general are French, and have six houses at Acre, with a consul: an Imperial agent too is lately settled there; also a resident for Russia.

That part of the bay of Acre in which ships anchor with the greatest security lies to the north of Mount Carmel, below the village of Haisa (commonly called *Caiffa*). The bottom is good holding ground, and does not chafe the cables; but the harbour is open to the north-west wind, which blows violently along all this coast. Mount Carmel, which commands it to the south, is a flattened cone, and very rocky; it is about 2000 feet high. We still find among the brambles wild vines and olive trees, which prove that industry has formerly been employed even in this ungrateful soil: on the summit is a chapel dedicated to the prophet Elias, which affords an extensive prospect over the sea and land. It is 20 miles S. of Tyre, and 37 N. of Jerusalem. E. long. 39. 25. lat. 32. 40.

Acre, in the Mogul's dominions, the same with lack, and signifies the sum of 100,000 rupees; the rupee is of the value of the French crown of three livres, or 30 sols of Holland; an 100 lacks of rupees make a couron in Indostan, or 10,000,000 rupees: the pound Sterling is about eight rupees; according to which proportion, a lack of rupees amounts to 12,500 pounds Sterling.

Acre, the universal measure of land in Britain. The word (formed from the Saxon *acher*, or the German *aker*, a field), did not originally signify a determined quantity of land, but any open ground, especially a wide champaign; and in this antique sense it seems to be preserved in the names of places, as Castle-acre, West-acre, &c. An acre in England contains four square roods, a rood 40 perches or poles of $16\frac{1}{2}$ feet each by statute. Yet this measure does not prevail in all parts of England, as the length of the pole varies in different counties, and is called *customary measure*, the difference running from the $16\frac{1}{2}$ feet to 28. The acre is also divided into 10 square chains, of 22 yards each, that is, 4840 square yards. An acre in Scotland contains four square roods; one square rood is 40 square falls; one square fall, 36 square ells; one square ell, nine square feet and 73 square inches; one square foot, 144 square inches. The Scots acre is also divided into 10 square chains; the measuring chain should be 24 ells in length, divided into 100 links, each link $8\frac{928}{1000}$ inches; and so one square chain will contain 10,000 square links. The English statute-acre is about three roods and six falls standard measure of Scotland.

The French acre, *arpent*, contains $1\frac{1}{4}$ English acre, or 54,450 square English feet, whereof the English acre contains only 43,560.—The Strasburg acre is about half an English acre.—The Welsh acre contains commonly two English ones.—The Irish acre is equal to one acre two roods and 19 perches $\frac{27}{121}$, English.

Dr Grew attempts to ascertain the number of acres in England, which, according to him, amounts to 46 millions and 80,000. The United Provinces are said to contain 4,382,000 acres: The province of Holland but one million of acres. The territory of the United States of America, according to calculations lately made by order of Congress, contains 589 millions of acres, exclusive of water, which is computed at 51 millions more.

Acre-Fight || Acridophagi.

Acre-Fight, an old sort of duel fought by English and Scottish combatants, between the frontiers of their kingdoms, with sword and lance: it was also called *camp-fight*, and the combatants *champions*, from the open field being the stage of trial.

Acre-Tax, a tax laid on land at so much per acre. In some places this is also called *acre-shot*. Impositions on lands in the great level are to be raised by a proportionable acre-tax, 20 Car. II. cap. 8.—An acre-tax of 2s. 6d. per acre, for draining Hadenham-level, 13 Geo. I. cap. 18.

ACRIBEIA, a term purely Greek, literally denoting an exquisite or delicate accuracy; sometimes used in our language, for want of a word of equal signification.

ACRID, a name for any thing that is of a sharp or pungent taste. See Materia Medica.

ACRIDOPHAGI, in the ancient geography, an Ethiopian people, represented as inhabiting near the deserts, and to have fed on locusts. This latter circumstance their name imports; the word being compounded of the Greek ακρις *locust*, and φαγω to *eat*. We have the following account of them by Diodorus Siculus*. Their stature was lower than that of other men; they were meagre, and extremely black. In the spring, high west winds drove from the desart to their quarter locusts of an extraordinary size, and remarkable for the squalid colour of their wings. So great was the number of these insects, that they were the only sustenance of the barbarians, who took them in the following manner: At the distance of some stadia from their habitations there was a wide and deep valley. They filled this valley with wood and wild herbs, with which their country abounded. When the cloud of locusts appeared, which were driven on by the wind, they set fire to the fuel which they had collected. The smoke which arose from this immense fire was so thick, that the locusts, in crossing the valley, were stifled by it, and fell in heaps on the ground. The passage of the locusts being thus intercepted for many days, they made a large provision of those insects. As their country produced great quantities of salt, they salted them, to render them more palatable, and to make them keep till the next season. This peculiar supply was their sole food: they had neither herds nor flocks. They were unacquainted with fishing; for they lived at a distance from the sea. They were very active, and ran with great swiftness. But their life was not of long duration; it exceeded not forty years. The close of their life was extremely miserable; for in their old age, winged lice of different, but all of ugly forms, bred in their bodies. This malady, which began in the breast and belly, soon spread through the whole frame. The patient at first felt an itching; and the agreeable sensation produced by his scratching of himself, preceded a most deplorable calamity. For when those lice, which had bred in his body, forced their way out, they caused effusions of corrupt blood, with excruciating pains in the skin. The unhappy man, with lamentable cries, was industrious himself to make passages for them with his nails. In short, these lice issued forth successively from the wounds made by the hands

* Lib. iii. & xxxix. Also Strabo, lib. xvi.

hands of the patient, as from a veſſel full of holes, and in ſuch numbers that it was impoſſible to exterminate them.—Whether this extraordinary and dreadful diſtemper was occaſioned by the food of the inhabitants of this country, or by a peſtilential quality of their climate, it is difficult to determine. Indeed, as to the credibility of the whole account, we muſt leave the reader to judge.

But though the circumſtances of theſe people ſhould be deemed fabulous, yet may the *acridophagia* be true. It is well known, that to this day the inhabitants of Ethiopia, Arabia, &c. frequently uſe locuſts as food. The reader will not be diſpleaſed if we lay before him the reſult of Dr Haſſelquiſt's inquiries as to this particular, who travelled in Syria and Egypt ſo late as the year 1752. This ingenious gentleman, who travelled with a view to improve natural hiſtory, informs us, that he aſked Franks, and many other people who had lived long in theſe countries, whether they had ever heard that the inhabitants of Arabia, Ethiopia, &c. uſed locuſts as food. They anſwered that they had. He likewiſe aſked the ſame queſtion of Armenians, Cophtes, and Syrians, who lived in Arabia, and had travelled in Syria and near the Red Sea; ſome of whom ſaid they heard of ſuch a practice, and others that they had often ſeen the people eat theſe inſects. He at laſt obtained complete ſatisfaction on this head from a learned ſheck at Cairo, who had lived ſix years in Mecca. This gentleman told him, in preſence of M. le Grand the principal French interpreter at Cairo, and others, that a famine frequently rages at Mecca when there is a ſcarcity of corn in Egypt, which obliges the inhabitants to live upon coarſer food than ordinary: That when corn is ſcarce, the Arabians grind the locuſts in hand-mills, or ſtone-mortars, and bake them into cakes, and uſe theſe cakes in place of bread: That he has frequently ſeen locuſts uſed by the Arabians, even when there was no ſcarcity of corn; but then they boil them, ſtew them with butter, and make them into a kind of fricaſſee; which he ſays is not diſagreeably taſted, for he had ſometimes taſted theſe locuſt-fricaſſees out of curioſity.

A later traveller, Dr Sparrman, informs us *, "That locuſts ſometimes afford a high treat to the more unpoliſhed and remote hordes of the Hottentots; when, as ſometimes happens, after an interval of 8, 10, 15, or 20 years, they make their appearance in incredible numbers. At theſe times they come from the north, migrating to the ſouthward, and do not ſuffer themſelves to be impeded by any obſtacles, but fly boldly on, and are drowned in the ſea whenever they come to it. The females of this race of inſects, which are moſt apt to migrate, and are chiefly eaten, are ſaid not to be able to fly; partly by reaſon of the ſhortneſs of their wings, and partly on account of their being heavy and diſtended with eggs; and ſhortly after they have laid theſe in the ſand, they are ſaid to die. It is particularly of theſe that the Hottentots make a brown coffee-coloured ſoup, which, at the ſame time, acquires from the eggs a fat and greaſy appearance. The Hottentots are highly rejoiced at the arrival of theſe locuſts, though they are ſure to deſtroy every bit of verdure on the ground: but the Hottentots make themſelves ample amends for this loſs, by falling foul on the animals themſelves, eating them in ſuch quantities as in the ſpace of a few days to get viſibly fatter and in better condition than before."

* *Voyage to the Cape*, vol. I. p. 36.

The abbé Poiret, alſo, in his Memoir on the Inſects of Barbary and Numidia, informs us, "That the Moors make locuſts a part of their food; that they go to hunt them; fry them in oil and butter; and ſell them publicly at Tunis, at Bonne," &c.

From theſe accounts, we may ſee the folly of that diſpute among divines about the nature of St John's food in the wilderneſs: ſome maintaining the original word to ſignify the fruits of certain trees; others, a kind of birds, &c.: but thoſe who adhered to the literal meaning of the text were at leaſt the moſt orthodox, although their arguments were perhaps not ſo ſtrong as they might have been, had they had an opportunity of quoting ſuch authors as the above.

ACRISIUS, king of Argos (fab. hiſt.), being told by the oracle that he ſhould be killed by his grandchild, ſhut up his only daughter Danaë in a brazen tower: but Jupiter coming down in a golden ſhower, begot Perſeus upon her: after Perſeus had ſlain the Gorgons, he carried Meduſa's head to Argos; which Acriſius ſeeing, was turned into a ſtatue.

ACRITAS (anc. geog.), a promontory of Meſſenia, running into the ſea, and forming the beginning of the bay of Meſſene. Now called *Capo di Gallo*, between Methone to the weſt, and Corone to the eaſt, where the Sinus Coronæus begins.

ACROAMATIC, or Acroatic, in general, denotes a thing ſublime, profound, or abſtruſe.

ACROAMATICI, a denomination given the diſciples or followers of Ariſtotle, &c. who were admitted into the ſecrets of the inner or acroamatic philoſophy.

ACROATIC. Ariſtotle's lectures to his diſciples were of two kinds, *exoteric* and *acroatic*. The acroatic were thoſe to which only his own diſciples and intimate friends were admitted; whereas the exoteric were public, and open to all. But there are other differences. The acroatic were ſet apart for the higher and more abſtruſe ſubjects; the exoteric were employed in rhetorical and civil ſpeculations. Again, the acroatics were more ſubtile and exact, evidence and demonſtration being here aimed at; the exoterics chiefly aimed at the probable and plauſible. The former were the ſubject of the mornings exerciſes in the Lyceum, the latter of the evenings. Add, that the exoterics were publiſhed: whereas the acroatics were kept ſecret; being either entirely concealed; or, if they were publiſhed, it was in ſuch obſcure terms, that few but his own diſciples could be the wiſer for them. Hence, when Alexander complained of his preceptor for publiſhing his acroatics, and thus revealing what ſhould have been reſerved to his diſciples, Ariſtotle anſwered, that they were made public and not public; for that none who had not heard them explained by the author *viva voce*, would underſtand them.

ACROATHOUM, or Acrothoum (anc. geog.), a town ſituated on the top of mount Athos, where the inhabitants, according to Mela, were longer lived by half than in any other country: called by the modern Greeks, Αγιον ορος; by the Italians, *La Cima di Monte Santo*.

ACROBATICA, or Acrobaticum, from ακρος, *high*, and βαίνω, or βαινω, *I go*; an ancient engine, whereby

whereby people were raised aloft, that they might see more conveniently about them. The *acrobatica* among the Greeks amounted to the same with what they call *scansorium* among the Latins. Authors are divided as to the office of this engine. Turnebus and Barbarus take it to have been of the military kind, raised by besiegers, high enough to overlook the walls, and discover the state of things on the other side. Baldus rather supposes it a kind of moveable scaffold, or cradle, contrived for raising painters, plasterers, and other workmen, to the tops of houses, trees, &c. Some suspect that it might have been used for both purposes; which is the opinion of Vitruvius and Aquinas.

ACROCERAUNIA, or Montes Ceraunii (anc. geog.), mountains running out into the sea (so called from their being often thunderstruck), separating the Ionian sea from the Adriatic; where Illyria ends and Epirus begins; now called *Monti della Chimera.*

ACROCHERISMUS, among the Greeks, a sort of gymnastic exercise, in which the two combatants contended with their hands and fingers only, without closing or engaging the other parts of the body.

ACROCORINTHUS (anc. geog.), a high and steep hill, hanging over the city of Corinth, which was taken within the walls, as an acropolis, or citadel. On its top stood a temple of Venus; and lower down issued the fountain Pyrene.

ACROMION, in anatomy, the upper part of the scapula or shoulder-blade. See Anatomy.

ACROMONOGRAMMATICUM, in poetry, a kind of poem, wherein every subsequent verse begins with the letter wherewith the immediately preceding one terminated.

ACRON, a celebrated physician of Agrigentum, who first thought of lighting large fires, and purifying the air with perfumes, to put a stop to the pestilence that ravaged Athens, and which was attended with success. He lived about 473 years before the Christian æra.

Acron, a territory on the gold-coast of Guinea, in Africa, bordering on the Fantynean country. The Dutch have a fort here called Fort Patience; and under it is a village, inhabited only by fishermen. The other inhabitants are addicted to husbandry, and sell their corn to other countries. There is plenty of game, which is very commodious for the Dutch factory. The people are very ignorant, and go naked like the rest of the negroes. This is called Little Acron; for Great Acron is farther inland, and is a kind of a republic.

ACRONICAL, Achronycal, or Achronical, in astronomy, is a term applied to the rising of a star, when the sun is set in the evening; but has been promiscuously used to express a star's rising at sunset, or setting at sun-rise.

ACRONIUS lacus, (Mela); a small lake formed by the Rhine, soon after its rise out of the Alps, and after passing the greater lake at Constance, called *Venetus*, and now the *Bodengee*, or lake of Constance.

ACROPOLIS (anc. geog.), the citadel, and one of the divisions of Athens; called *Polis*, because constituting the first and original city; and the *Upper* Polis, to distinguish it from the Lower, which was afterwards built round it in a large open plain, the Acropolis standing on a rock or eminence in the heart of this plain; and hence its name: To the north it had a wall, built by the Pelasgi, and therefore called *Pelasgic;* and to the south a wall, by Cymon the son of Miltiades, out of the Persian spoils, many ages after the building of the north wall. It had nine gates, and was therefore called *Enneapylon;* yet but one principal gate or entrance, the ascent to which was by a flight of steps of white marble, built by Pericles with great magnificence, (Plutarch).

ACROPOLITA (George), one of the writers in the Byzantine history, was born at Constantinople, in the year 1220, and brought up at the court of the emperor John Ducas at Nice. He was employed in the most important affairs of the empire; being sent ambassador to Larissa, to establish a peace with Michael of Epirus; and was constituted judge to try Michael Comnenus, suspected of engaging in a conspiracy. Theodorus Lascaris, the son of John, whom he had taught logic, appointed him governor of all the western provinces in his empire. In 1255, he was taken prisoner in a war with Michael Angelus: but gaining his liberty in 1260, by means of the emperor Palæologus, he was sent by him ambassador to Constantine prince of Bulgaria; and was employed in several other negociations. He wrote, A Continuation of the Greek History, from the taking of Constantinople by the Latins till it was recovered by Michael Palæologus in 1261, which makes part of the Byzantine history; A Treatise concerning Faith, Virtue, and the Soul; An Exposition of the Sermons of St Gregory Nazianzen and other pieces. Gregory Cyprian, patriarch of Constantinople, in his encomium upon him, prefixed to Acrapolita's history, is perhaps somewhat extravagant in his praise, when he says he was equal to Aristotle in philosophy, and to Plato in the knowledge of divine things and Attic eloquence.

ACROSPIRE, a vulgar term for what botanists call the *plume*. See the article Plants.

ACROSPIRED, in malt-making, is the grain's shooting both at the root and blade end.

ACROSTIC, in poetry, a kind of poetical composition, disposed in such a manner, that the initial letters of the verses form the name of some person, kingdom, place, motto, &c. The word is compounded of the Greek ακρος, *extremity*, and στιχος, *verse*. The acrostic is considered by the critics as a species of false wit, and is therefore very little regarded by the moderns.

ACROSTICUM, Rustyback, Wall-rue, or Fork-fern, in botany, a genus of the cryptogamia filices. The fructifications are accumulated on the whole inferior surface of the frond, so that they everywhere cover it. There are upwards of 30 species; but only three of them (according to others, two) are natives of Britain, *viz.* the septentrionale, or horned fern, which grows on walls or clifts of rocks; the ilvense, or hairy fern, growing in clifts of rocks; and the thelypteris, or marsh-fern, in turfy bogs.

ACROSTOLIUM, in ancient naval architecture, the extreme part of the ornament used on the prows of their ships, which was sometimes in the shape of a buckler, helmet, animal, &c.; but more frequently circular, or spiral. It was usual to tear them from the prows of vanquished vessels, and fix them to the conquerors, as a signal of victory.

Acroteleutic || Act.

ACROTELEUTIC, among ecclefiaftic writers, an appellation given to any thing added to the end of a pfalm; as the Gloria Patri, or Doxology.

ACROTERIA, in architecture, fmall pedeftals, ufually without bafes, anciently placed at the middle or two extremes of pediments or frontifpieces, ferving to fupport the ftatues, &c. It alfo fignifies the figures placed as ornaments on the tops of churches, and the fharp pinnacles that ftand in ranges about flat buildings with rails and ballufters.

Among ancient phyficians, it fignified the larger extremities of the body, as the head, hands, and feet. It has alfo been ufed for the tips of the fingers, and fometimes for the eminences or proceffes of bones.

ACROTHYMION, from ακρ☉, *extreme*, and θυμος *thyme*. A fort of wart defcribed by Celfus as hard, rough, with a narrow bafis and broad top; the top is of the colour of thyme, it eafily fplits and bleeds. This tumour is alfo called *thymus*.

ACT, in general, denotes the exertion of power; and differs from power, as the effect from the caufe.

Act, in logic, is particularly underftood of an operation of the human mind. Thus to difcern and examine, are acts of the underftanding; to judge and affirm, are acts of the will. There are voluntary and fpontaneous acts; the former are produced by the operation of the foul, the latter without its privity or participation.

Act, in the univerfities, fignifies a thefis maintained in public by a candidate for a degree, or to fhow the capacity and proficiency of a ftudent. The candidates for a degree of bachelor and mafter of arts are to hold philofophical Acts; and thofe for bachelor of divinity, theological Acts, &c. At Oxford, the time when mafters or doctors complete their degrees is alfo called the *act;* which is held with great folemnity. At Cambridge, they call it the *commencement.*

Act of Faith, *Auto da Fe*, in the Romifh church, is a folemn day held by the inquifition, for the punifhment of heretics, and the abfolution of the innocent accufed*. They ufually contrive the *Auto* to fall on fome great feftival, that the execution may pafs with the more awe and regard; at leaft it is always on a Sunday.

* See *Inquifition.*

The Auto da Fe may be called the laft act of the inquifitorial tragedy; it is a kind of goal-delivery, appointed as oft as a competent number of prifoners in the inquifition are convicted of herefy, either by their own voluntary, or extorted confeffion, or on the evidence of certain witneffes. The procefs is thus: in the morning they are brought into a great hall, where they have certain habits put on, which they are to wear in the proceffion. The proceffion is led up by dominican friars; after which come the penitents, fome with fan-benitoes, and fome without, according to the nature of their crimes; being all in black coats without fleeves, and bare-footed, with a wax candle in their hands. Thefe are followed by the penitents who have narrowly efcaped being burnt, who over their black coats have flames painted with their points turned downwards, *Feugo revolto.* Next come the negative, and relapfed, who are to be burnt, having flames on their habits pointing upwards. After thefe come fuch as profefs doctrines contrary to the faith of Rome, who, befides flames pointing upwards, have their picture painted on their breafts, with dogs, ferpents, and devils, all open-mouthed, about it. Each prifoner is attended with a familiar of the inquifition; and thofe to be burnt have alfo a Jefuit on each hand, who are continually preaching to them to abjure. After the prifoners, comes a troop of familiars on horfeback; and after them the inquifitors, and other officers of the court, on mules; laft of all, the inquifitor-general on a white horfe, led by two men with black hats and green hat-bands. A fcaffold is erected in the *Terriero de Paio*, big enough for two or three thoufand people; at one end of which are the prifoners, at the other the inquifitors. After a fermon made up of encomiums of the inquifition, and invectives againft heretics, a prieft afcends a defk near the middle of the fcaffold, and having taken the abjuration of the penitents, recites the final fentence of thofe who are to be put to death; and delivers them to the fecular arm, earneftly befeeching at the fame time the fecular power not to touch their blood, or put their lives in danger. The prifoners being thus in the hands of the civil magiftrate, are prefently loaded with chains, and carried firft to the fecular goal, and from thence in an hour or two brought before the civil judge; who, after afking in what religion they intend to die, pronounces fentence, on fuch as declare they die in the communion of the church of Rome, that they fhall be firft ftrangled, and then burnt to afhes; on fuch as die in any other faith, that they be burnt alive. Both are immediately carried to the Ribera, the place of execution; where there are as many ftakes fet up as there are prifoners to be burnt, with a quantity of dry furz about them. The ftakes of the profeffed, that is, fuch as perfift in their herefy, are about four yards high, having a fmall board towards the top for the prifoner to be feated on. The negative and relapfed being firft ftrangled and burnt, the profeffed mount their ftakes by a ladder; and the Jefuits, after feveral repeated exhortations to be reconciled to the church, part with them, telling them they leave them to the devil, who is ftanding at their elbow to receive their fouls, and carry them with him into the flames of hell. On this a great fhout is raifed; and the cry is, Let the dogs *beards be made;* which is done by thrufting flaming furzes faftened to long poles againft their faces, till their faces are burnt to a coal, which is accompanied with the loudeft acclamations of joy. At laft, fire is fet to the furz at the bottom of the ftake, over which the profeffed are chained fo high, that the top of the flame feldom reaches higher than the feat they fit on; fo that they rather feem roafted than burnt. There cannot be a more lamentable fpectacle; the fufferers continually cry out, while they are able, *Mifericordia per amor de Dios*, "Pity for the love of God!" yet it is beheld by all fexes, and ages, with tranfports of joy and fatisfaction.

Act, in dramatic poetry, fignifies a certain divifion, or part, of a play, defigned to give fome refpite both to the actors and fpectators. The Romans were the firft who divided their theatrical pieces into acts; for no fuch divifions appear in the works of the firft dramatic poets. Their pieces indeed confifted of feveral parts or divifions, which they called *protafis*, *epitafis*, *cataftafis*, and *cataftrophe;* but thefe divifions were not marked by any real interruptions on the theatre. Nor does Ariftotle mention any thing of acts in his Art of Poetry. But, in the time of Horace, all regular and finifhed pieces were divided into five acts.

Neuve minor, neu ſit quinto productior actu
Fabula, quæ poſci vult & ſpectata reponi.

The firſt act, according to ſome critics, beſides introducing upon the ſtage the principal characters of the play, ought to propoſe the argument or ſubject of the piece; the ſecond, to exhibit this to the audience, by carrying the fable into execution; the third, to raiſe obſtacles and difficulties: the fourth, to remove theſe, or raiſe new ones in the attempt; and the fifth, to conclude the piece, by introducing ſome accident that may unravel the whole affair. This diviſion, however, is not eſſentially neceſſary; but may be varied according to the humour of the author, or the nature of the ſubject. See POETRY, Part II. Sect. i.

Act of Grace. See GRACE.

ACT, among lawyers, is an inſtrument in writing for declaring or juſtifying the truth of any thing. In which ſenſe, records, decrees, ſentences, reports, certificates, &c. are called *acts*.

ACTS, alſo denote the deliberations and reſolutions of an aſſembly, ſenate, or convention; as acts of parliament, &c. Likewiſe matters of fact tranſmitted to poſterity in certain authentic books and memoirs.

ACTA Conſiſtorii, the edicts or declarations of the council of ſtate of the emperors. Theſe edicts were generally expreſſed in ſuch terms as theſe: "The auguſt emperors, *Diocleſian* and *Maximian*, in council declared, That the children of Decurions ſhould not be expoſed to wild beaſts in the amphitheatre."

The ſenate and ſoldiers often ſwore, either through abject flattery or by compulſion, upon the *edicts* of the emperor, as we do upon the *bible*. And the name of *Apidius Merula* was eraſed by Nero out of the regiſter of ſenators, becauſe he refuſed to ſwear upon the edicts of the emperor Auguſtus.

ACTA Diurna, was a ſort of Roman gazette, containing an authorized narrative of the tranſactions worthy of notice which happened at Rome. Petronius has given us a ſpecimen of the *acta diurna* in his account of Trimalchis; and as it may not perhaps be unentertaining to ſee how exactly a Roman newſpaper runs in the ſtyle of an Engliſh one, the following is an article or two out of it:

"On the 26th of July, 30 boys and 40 girls were born at Trimalchi's eſtate at Cuma.

"At the ſame time a ſlave was put to death for uttering diſreſpectful words againſt his lord.

"The ſame day a fire broke out in Pompey's gardens, which began in the night, in the ſteward's apartment."

ACTA Populi, among the Romans, were journals or regiſters of the daily occurrences; as aſſemblies, trials, executions, buildings, births, marriages, deaths, &c. of illuſtrious perſons, and the like. Theſe were otherwiſe called *Acta Publica*, and *Acta Diurna*, or ſimply *Acta*. The *Acta* differed from Annals, in that only the greater and more important matters were in the latter, and thoſe of leſs note were in the former. Their origin is attributed to Julius Cæſar, who firſt ordered the keeping and making public the acts of the people. Some trace them higher, to Servius Tullius; who, to diſcover the number of perſons born, dead, and alive, ordered that the next of kin, upon a birth, ſhould put a certain piece of money into the treaſury of Juno Lucina; upon a death, into that of Venus Libitina: the like was alſo to be done upon aſſuming the toga virilis, &c. Under Marcus Antoninus, this was carried further: perſons were obliged to notify the births of their children, with their names and ſurnames, the day, conſul, and whether legitimate or ſpurious, to the præfects of the *Ærarium Saturni*, to be entered in the public acts; though before this time the births of perſons of quality appear thus to have been regiſtered.

ACTA Senatus, among the Romans, were minutes of what paſſed and was debated in the ſenate-houſe. Theſe were alſo called *Commentarii*, and by a Greek name ὑπομνηματα. They had their origin in the conſulſhip of Julius Cæſar, who ordered them both to be kept and publiſhed. The keeping them was continued under Auguſtus, but the publication was abrogated. Afterwards all writings, relating to the decrees or ſentences of the judges, or what paſſed and was done before them, or by their authority, in any cauſe, were alſo called by the name *Acta*. In which ſenſe we read of civil acts, criminal acts, intervenient acts; *acta civilia, criminalia, interventientia*, &c.

Public ACTS. The knowledge of public acts forms part of a peculiar ſcience, called the DIPLOMATIC, of great importance to an hiſtorian, ſtateſman, chronologer, and even critic. The preſervation of them was the firſt occaſion of erecting libraries. The ſtyle of acts is generally barbarous Latin. Authors are divided as to the rules of judging of their genuineneſs, and even whether there be any certain rules at all. F. Germon will have the greater part of the acts of former ages to be ſpurious. Fontanini aſſerts, that the number of forged acts now extant is very ſmall. It is certain there were ſevere puniſhments inflicted on the forgers and falſifiers of acts.—The chief of the Engliſh acts, or public records, are publiſhed by Rymer, under the title of *Fœdera*, and continued by Saunderſon; an extract whereof has been given in French by Rapin, and tranſlated into Engliſh under the title of *Acta Regia*. Great commendations have been given this work: alſo ſome exceptions made to it; as that there are many ſpurious acts, as well as errors, in it; ſome have even charged it with falſifications.—The public acts of France fell into the hands of the Engliſh after the battle of Poitiers, and are commonly ſaid to have been carried by them out of the country. But the tradition is not ſupported by any ſufficient teſtimony.

ACTS of the Apoſtles, one of the ſacred books of the New Teſtament, containing the hiſtory of the infant-church, during the ſpace of 29 or 30 years from the aſcenſion of our Lord to the year of Chriſt 63.—It was written by St Luke; and addreſſed to Theophilus, the perſon to whom the evangeliſt had before dedicated his goſpel. We here find the accompliſhment of ſeveral of the promiſes made by our Saviour; his aſcenſion; the deſcent of the Holy Ghoſt; the firſt preaching of the apoſtles, and the miracles whereby their doctrines were confirmed; an admirable picture of the manners of the primitive Chriſtians; and, in ſhort, every thing that paſſed in the church till the diſperſion of the apoſtles, who ſeparated themſelves in order to propagate the goſpel throughout the world. From the period of that ſeparation, St Luke quits the hiſtory of the other apoſtles, who were then at too great a diſtance from him, and confines himſelf more particularly to that of St Paul, who had choſen him for the companion of his labours. He follows that apoſtle in all his miſſions, and

Acts.

and even to Rome itſelf; for it appears that the Acts were publiſhed in the ſecond year of St Paul's reſidence in that city, or the 36th year of the Chriſtian æra, and in the 9th or 10th year of Nero's reign. The ſtyle of this work, which was originally compoſed in Greek, is much purer than that of the other canonical writers; and it is obſervable, that St Luke, who was much better acquainted with the Greek than with the Hebrew language, always, in his quotations from the Old Teſtament, makes uſe of the Septuagint verſion. The council of Laodicea places the Acts of the Apoſtles among the canonical books, and all the churches have acknowledged it as ſuch without any controverſy.

There were ſeveral *Spurious* Acts of the Apostles; particularly, I. *Acts*, ſuppoſed to be written by Abdias*, the pretended biſhop of Babylon, who gave out that he was ordained biſhop by the apoſtles themſelves when they were upon their journey into Perſia. II. *The Acts of St Peter:* this book came originally from the ſchool of the Ebionites. III. *The Acts of St Paul*, which is entirely loſt. Euſebius, who had ſeen it, pronounces it of no authority. IV. *The Acts of St John the Evangeliſt;* a book made uſe of by the Encratites, Manichæans, and Priſcillianiſts. V. *The Acts of St Andrew;* received by the Manichæans, Encratites, and Apotactics. VI. *The Acts of St Thomas the Apoſtle;* received particularly by the Manichæans. VII. *The Acts of St Philip.* This book the Gnoſtics made uſe of. VIII. *The Acts of St Matthias.* Some have imagined that the Jews for a long time had concealed the original acts of the life and death of St Matthias written in Hebrew; and that a monk of the abbey of St Matthias at Treves, having got them out of their hands, procured them to be tranſlated into Latin, and publiſhed them; but the critics will not allow them to be authentic.

* See *Abdias*.

Acts of Pilate; a relation ſent by Pilate to the emperor Tiberius, concerning Jeſus Chriſt, his death, reſurrection, aſcenſion, and the crimes of which he was convicted before him †. It was a cuſtom among the Romans, that the proconſuls and governors of provinces ſhould draw up acts, or memoirs, of what happened in the courſe of their government, and ſend them to the emperor and ſenate. The genuine *acts* of Pilate were ſent by him to Tiberius, who reported them to the ſenate; but they were rejected by that aſſembly, becauſe not immediately addreſſed to them: as is teſtified by Tertullian, in his Apol. cap. 5. and 20, 21. The heretics forged acts in imitation of them: in the reign of the emperor Maximin, the Gentiles, to throw an odium on the Chriſtian name, ſpread about ſpurious Acts of Pilate; which the emperor, by a ſolemn edict, ordered to be ſent into all the provinces of the empire, and enjoined the ſchool-maſters to teach and explain them to their ſcholars, and make them learn them by heart. Theſe acts, both the genuine and the ſpurious, are loſt. There is indeed extant, in the Pſeudo-Hegeſippus, a letter from Pilate to the emperor Claudius, concerning Jeſus Chriſt ‡; but it diſcovers itſelf at firſt ſight not to be authentic.

† Euſebii *Hiſt. Eccleſ.* lib ii. cap. 2. and ix. 5.

‡ Cave *Hiſt. Literar. Sæc. Apoſtol.*

Act of Parliament is a poſitive law, conſiſting of two parts, the words of the act, and its true ſenſe and meaning; which being joined, make the law. The words of acts of parliament ſhould be taken in a lawful ſenſe. Caſes of the ſame nature are within the intention, though without the letter, of the act; and ſome acts extend by equity to things not mentioned therein. See Parliament.

Actæ, Actæa.

ACTÆ, were meadows of remarkable verdure and luxuriancy near the ſea-ſhore, where the Romans uſed to indulge themſelves to a great degree in ſoftneſs and delicacy of living. The word is uſed in this ſenſe by Cicero and Virgil; but Voſſius thinks it can only be uſed in ſpeaking of Sicily, as theſe two authors did.

ACTÆA, Aconitum Racemosum, Herb Cristopher, or Bane-berries; a genus of the monogynia order, belonging to the polyandria claſs of plants. The characters are: The *calyx* is a perianthium conſiſting of four roundiſh, obtuſe, concave leaves, which fall off. The *corrolla* conſiſts of four petals, larger than the calyx, pointed at both ends, and falling off. The *ſtamina* conſiſt of numerous capillary filaments; the antheræ are roundiſh, erect, and didymous. The *piſtillum* has an ovate germen; no ſtylus; the ſtigma thickiſh and obliquely depreſſed. The *pericarpium* is an oval ſmooth one-furrow'd one-cell'd berry. The *ſeeds* are very numerous, ſemiorbicular, and incumbent in a double order.—This genus is aſſociated with the *Multiſiliquæ*, the 26th natural order. There are four

Species and properties. 1. The ſpicata, or common herb-chriſtopher, is a native in ſeveral parts of Britain. It grows to the height of about two feet and an half; the foot-ſtalks of the leaves ariſe from the root; theſe divide into three ſmaller foot-ſtalks, each of which are again divided into three, and theſe have each three lobes; ſo that each leaf is compoſed of 27 lobes or ſmaller leaves. The flowers grow in ramous ſpikes, and are of a pure white: they are borne upon a ſlender, jointed, and furrowed ſtem; appear in May; and are ſucceeded by black, ſhining, pulpy berries, about the ſize of peas, which ripen in the autumn. This plant is a powerful repellent, and the root has been uſed internally in ſome nervous caſes, but muſt be adminiſtered with caution. The berries are highly poiſonous. It is ſaid toads reſort to this plant, on account of its fetid ſmell. Sheep and goats eat it; cows, horſes, and ſwine, refuſe it. 2. The alba, or American herb-chriſtopher, is a native of North America. The leaves of this ſpecies are ſomewhat like the former, but not ſo deeply indented in the edges. The flowers grow in a more compact ſpike, and the berries are very white and tranſparent when ripe; the roots are compoſed of thick knobs. This ſpecies has been uſed as an emetic, and ſometimes called *ipecacoanha*. 3. The racemoſa, or American black or wild ſnakeroot, is likewiſe a native of North America. It has large compound leaves, riſing immediately from the root, and branched after the ſame manner as the firſt, which grow more than two feet high. The flower-ſtem riſes to the height of four or five feet; and carries a long ſpike of white flowers reflexed at the top. Theſe appear in June or the beginning of July, but the ſeeds do not come to maturity in Britain. The root of this plant is greatly uſed by phyſicians in North America, in many diſorders; and is ſuppoſed to be an antidote againſt poiſon, or the biting of a rattle-ſnake. 4. The cimicifuga, is a native of Siberia; the leaves reſemble thoſe of the feathered columbine; the ſtalks riſe little more than a foot high, ſupporting particles of white flowers, which appear in May. This ſpecies is rare in Britain.

Culture.

Culture. The first species hath a perennial root, but the stalks annually decay. It may be propagated either by seeds, or parting the roots, which should be transplanted in autumn. The seeds should be sown soon after they are ripe, or they will lie a whole year in the ground before they vegetate. They should be sown in a shady border; and as all the plants do not come up at the same time, the border should not be disturbed till the following autumn, when they should be transplanted into a shady border, where they may be allowed to remain and flower.—The second species may be propagated in the same manner; only the plants should be allowed three feet every way, on account of their wide-spreading leaves. This species delights in a light moist soil, and a shady situation.—The third is usually propagated by seeds sent annually from North America: it thrives in the same kind of soil as the former; and is very hardy, requiring no other culture than the common flowering-shrubs. The plants should not be often removed, for that will prevent their flowering strong.—The fourth requires a moist loamy soil, and shady situation. It may be propagated in the same manner as the others.

ACTÆON, in fabulous history, the son of Aristæus and Autonoe; a great hunter. He was turned by Diana into a stag, for looking on her while bathing; and died by his own dogs.

ACTANIA, an island, according to Pliny, in the North sea. It lies to the west of Holstein and Ditmersch, not far from the mouth of the Eyder and Elbe, and is now called *Heyligland*.

ACTE. See SAMBUCUS.

ACTIAN GAMES, in Roman antiquity, were solemn games instituted by Augustus, in memory of his victory over Marc Anthony at Actium, held every fifth year, and celebrated in honour of Apollo, since called *Actius* Hence *Actian* Years, an æra commencing from the battle of Actium, called the *Æra of Augustus*.

Virgil insinuates them to have been instituted by Æneas; from that passage Æn. III. v. 280.

Actiaque Iliacis celebramus littora ludis.
ÆN. iii. 250.

But this he only does by way of compliment to Augustus; attributing that to the hero from whom he descended, which was done by the emperor himself: as is observed by Servius.

ACTINIA, in zoology, a genus belonging to the order of vermes mollusca. The body is oblong and smooth, attaching itself firmly by its basis to rocks or other solid substances, having a dilatable apex hooked within. The mouth is furnished with crooked teeth, the rostrum cylindrical and radiated. There are five species, some of which make a beautiful appearance, and are called *Animal Flowers*, *Sea Anemonies*, and *Urtica Marina*. See ANIMAL *Flower*.

Progressive motion in these creatures is so slow, that it is difficult to perceive any, as they scarce advance the length of one inch in an hour. It would seem they do not all produce, when handled, the painful sensation which had acquired them the name of *sea-nettles*.—They are viviparous, feed on shell fish, open their mouth more or less according to the size of the prey they have to deal with, and then reject the shell through the same aperture. When the mouth is open, all the tentacula of the actinia may be seen, resembling in that situation a full-blown flower, which has given it the denomination of the *flower fish*.

ACTIO, in Roman antiquities, an action at law in a court of justice. The formalities used by the Romans, in judicial actions, were these: If the difference failed to be made up by friends, the injured person proceeded *in jus reum vocare*, to summon the offending party to the court, who was obliged to go, or give bond for his appearance.

The offending party might be summoned into court *viva voce*, by the plaintiff himself meeting the defendant, declaring his intention to him, and commanding him to go before the magistrate and make his defence. If he would not go willingly, he might drag and force him along, unless he gave security for his appearance on some appointed day. If he failed to appear on the day agreed on, then the plaintiff, whensoever he met him, might take him along with him by force, calling any by-standers to bear witness, by asking them *visne antestari*; the by-standers upon this turned their ear towards him in token of their consent: To this Horace alludes in his Sat. against the impertinent, Lib. i. Sat. 9. See this further explained under the article ANTESTARI.

Both parties being met before the prætor, or other supreme magistrate presiding in the court, the plaintiff proposed the action to the defendant; in which he designed to prosecute him. This they termed *edere actionem*; and was commonly performed by writing it in a tablet, and offering it to the defendant, that he might see whether he had better stand the suit or compound.

In the next place came the *postulatio actionis*, or the plaintiff's petition to the prætor, for leave to prosecute the defendant in such an action. The petition was granted by writing at the bottom of it *actionem do*, or refused by writing in the same manner *actionem non do*.

The petition being granted, the plaintiff *vadabatur reum*, i. e. obliged him to give sureties for his appearance on such a day in the court; and this was all that was done in public, before the day fixed upon for the trial.

In the mean time, the difference was often made up, either *transactione*, by letting the cause fall as dubious; or *pactione*, by composition for damages amongst friends.

On the day appointed for hearing, the prætor ordered the several bills to be read, and the parties summoned by an *accensus*, or beadle. See ACCENSI.

Upon the non-appearance of either party, the defaulter lost his cause;—if they both appeared, they were said *se stetisse*; and then the plaintiff proceeded *litem sive actionem intendere*, i. e. to prefer his suit, which was done in a set form of words, varying according to the difference of the actions. After this the plaintiff desired judgment of the prætor, that is, to be allowed a *judex* or *arbiter*, or else the *recuperatores* or *centumviri*. These he requested for the hearing and deciding the business; but none of them could be desired but by the consent of both parties.

The prætor having assigned them their judges, defined and determined the number of witnesses to be admitted, to hinder the protracting of the suit; and then the parties proceeded to give their caution, that the

the judgment, whatever it was, ſhould ſtand and be performed on both ſides. The judges took a ſolemn oath to be impartial; and the parties took the *juramentum calumniæ*. Then the trial began with the aſſiſtance of witneſſes, writings, &c. which was called *diſceptatio cauſæ*.

ACTION, in a general ſenſe, implies nearly the ſame thing with ACT.—Grammarians, however, obſerve ſome diſtinction between *action* and *act*; the former being generally reſtricted to the common or ordinary tranſactions, whereas the latter is uſed to expreſs thoſe which are remarkable. Thus, we ſay it is a good *action* to comfort the unhappy; it is a generous *act* to deprive ourſelves of what is neceſſary, for their ſake. The wiſe man propoſes to himſelf an honeſt end in all his *actions*; a prince ought to mark every day of his life with ſome *act* of greatneſs. The abbé Girard makes a further diſtinction between the words *action* and *act*: The former, according to him, has more relation to the power that acts than the latter; whereas the latter has more relation to the effect produced than the former: and hence the one is properly the attribute of the other. Thus we may properly ſay, "Be ſure to preſerve a preſence of mind in all your actions; and take care that they be all acts of equity."

ACTION, in mechanics, implies either the effort which a body or power makes againſt another body or power, or the effect itſelf of that effort.

As it is neceſſary in works of this kind to have a particular regard to the common language of mechanics and philoſophers, we have given this double definition: but the proper ſignification of the term is the motion which a body really produces, or tends to produce, in another; that is, ſuch is the motion it would have produced, had nothing hindered its effect.

All power is nothing more than a body actually in motion, or which tends to move itſelf; that is, a body which would move itſelf if nothing oppoſed it. The action therefore of a body is rendered evident to us by its motion only; and conſequently we muſt not fix any other idea to the word action, than that of actual motion, or a ſimple tendency to motion. The famous queſtion relating to *vis viva*, and *vis mortua*, owes, in all probability, its exiſtence to an inadequate idea of the word action; for had Leibnitz and his followers obſerved, that the only preciſe and diſtinct idea we can give to the word force or action, reduces it to its effect, that is, to the motion it actually produces or tends to produce, they would never have made that curious diſtinction.

Quantity of ACTION, a name given by M. de Maupertuis, in the Memoirs of the Pariſian Academy of Sciences for 1744, and thoſe of Berlin for 1746, to the product of the maſs of a body by the ſpace which it runs through, and by its celerity. He lays it down as a general law, "that, in the changes made in the ſtate "of a body, the quantity of action neceſſary to pro- "duce ſuch change, is the leaſt poſſible." This principle he applies to the inveſtigation of the laws of refraction, of equilibrium, &c. and even to the ways of acting employed by the Supreme Being. In this manner M. de Maupertuis attempts to connect the metaphyſics of final cauſes with the fundamental truths of mechanics, to ſhow the dependence of the colliſion of both elaſtic and hard bodies upon one and the ſame law, which before had always been referred to ſeparate laws; and to reduce the laws of motion, and thoſe of equilibrium, to one and the ſame principle.

ACTION, in ethics, denotes the external ſigns or expreſſions of the ſentiments of a moral agent. See *ACTIVE Power, infra*.

ACTION, in poetry, the ſame with ſubject or fable. Critics generally diſtinguiſh two kinds, the principal and the incidental. The principal action is what is generally called the *fable*; and the incidental an *epiſode*. See POETRY, Part II.

ACTION, in oratory, is the outward deportment of the orator, or the accommodation of his countenance, voice, and geſture, to the ſubject of which he is treating. See ORATORY, Part IV.

ACTION, in a theatrical ſenſe. See DECLAMATION, Art. IV.

ACTION for the Pulpit. See DECLAMATION, Art. I.

ACTION, in painting and ſculpture, is the attitude or poſition of the ſeveral parts of the face, body, and limbs of ſuch figures as are repreſented, and whereby they ſeem to be really actuated by paſſions. Thus we ſay, the action of ſuch a figure finely expreſſes the paſſions with which it is agitated: we alſo uſe the ſame expreſſion with regard to animals.

ACTION, in phyſiology, is applied to the functions of the body, whether vital, animal, or natural.

The *vital* functions, or actions, are thoſe which are abſolutely neceſſary to life, and without which there is no life, as the action of the heart, lungs, and arteries. On the action and reaction of the ſolids and fluids on each other, depend the vital functions. The pulſe and reſpiration are the external ſigns of life. Vital diſeaſes are all thoſe which hinder the influx of the venous blood into the cavities of the heart, and the expulſion of the arterial blood from the ſame.—The *natural* functions are thoſe which are inſtrumental in repairing the ſeveral loſſes which the body ſuſtains; for life is deſtructive of itſelf, its very offices occaſioning a perpetual waſte. The manducation of food, the deglutition and digeſtion thereof, alſo the ſeparation and diſtribution of the chyle and excrementitious parts, &c. are under the head of natural functions, as by theſe our aliment is converted into our nature. They are neceſſary to the continuance of our bodies.—The *animal* functions are thoſe which we perform at will, as muſcular motion, and all the voluntary actions of the body: they are thoſe which conſtitute the ſenſes of touch, taſte, ſmell, ſight, hearing; perception, reaſoning, imagination, memory, judgment, affections of the mind. Without any, or all of them, a man may live, but not ſo comfortably as with them.

ACTION, in commerce, is a term uſed abroad for a certain part or ſhare of a public company's capital ſtock. Thus, if a company has 400,000 livres capital ſtock, this may be divided into 400 actions, each conſiſting of 1000 livres. Hence a man is ſaid to have two, four, &c. actions, according as he has the property of two, four, &c. 1000 livres capital ſtock. The transferring of actions abroad is performed much in the ſame manner as ſtocks are with us. See STOCKS.

ACTION, in law, is a demand made before a judge for obtaining what we are legally intitled to demand, and is more commonly known by the name of *law-ſuit* or *proceſs*. See SUIT.

ACTIONARY,

ACTIONARY, or ACTIONIST, a proprietor of ftock in a trading company.

ACTIONS, among merchants, fometimes fignify moveable effects; and we fay the merchant's creditors have feized on all his actions, when we mean that they have taken poffeffion of all his active debts.

ACTIVE, denotes fomething that communicates action or motion to another; in which acceptation it ftands oppofed to paffive.

ACTIVE, in grammar, is applied to fuch words as exprefs action; and is therefore oppofed to paffive. The active performs the action, as the paffive receives it. Thus we fay, a verb *active*, a conjugation *active*, &c. or an *active* participle.

ACTIVE Verbs, are fuch as do not only fignify doing, or acting; but have alfo nouns following them, to be the fubject of the action or impreffion: thus, *To love, to teach*, are verbs *active;* becaufe we can fay, *To love a thing, to teach a man.* Neuter verbs alfo denote an action, but are diftinguifhed from active verbs, in that they cannot have a noun following them: fuch are, *To fleep, to go, &c.*—Some grammarians, however, make three kinds of active verbs: the *tranfitive*, where the action paffes into a fubject different from the agent; *reflected*, where the action returns upon the agent; and *reciprocal*, where the action turns mutually upon the two agents who produced it.

ACTIVE Power, in metaphyfics, the power of executing any work or labour; in contradiftinction to *fpeculative* powers *, or the powers of feeing, hearing, remembering, judging, reafoning, &c.

* Dr Reid *on the Active Powers of Man*, p. 12.

The exertion of active power we call *action;* and as every action produces fome change, fo every change muft be caufed by fome effect, or by the ceffation of fome exertion of power. That which produces a change by the exertion of its power, we call the *caufe* of that change; and the change produced, the *effect* of that caufe. See METAPHYSICS.

ACTIVE Principles, in chemiftry, fuch as are fuppofed to act without any affiftance from others; as mercury, fulphur, &c.

ACTIVITY, in general, denotes the power of acting, or the active faculty. See ACTIVE.

Sphere of ACTIVITY, the whole fpace in which the virtue, power, or influence, of any object, is exerted.

ACTIUM (anc. geog.), a town fituated on the coaft of Acarnania, in itfelf inconfiderable, but famous for a temple of Apollo, a fafe harbour, and an adjoining promontory of the fame name, in the mouth of the Sinus Ambracius, over againft Nicopolis, on the other fide of the bay: it afterwards became more famous on account of Auguftus's victory over Antony and Cleopatra; and for quinquennial games inftituted there, called *Actia* or *Ludi Actiaci.* Hence the epithet *Actius*, given to Apollo (Virgil). *Actiaca æra*, a computation of time from the battle of Actium. The promontory is now called *Capo di Figalo.*

ACTIUS, in mythology, a furname of Apollo, from Actium, where he was worfhipped.

ACTON, a town near London, where is a well that affords a purging water, which is noted for the pungency of its falt. This water is whitifh, to the tafte it is fweetifh, with a mixture of the fame bitter which is in the Epfom water. The falt of this water is not quite fo foft as that of Epfom; and is more calcareous than

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it, being more of the nature of the falt of lime: for a quantity of the Acton water being boiled high, on being mixed with a folution of fublimate in pure water, threw down a yellow fediment. The falt of the Acton water is more nitrous than that of Epfom; it ftrikes a deep red, or purple, with the tincture of logwood in brandy, as is ufual with nitrous falts; it does not precipitate filver out of the fpirit of nitre, as common falt does: $1\frac{1}{2}$ ℔ of this water yields 48 grains of falt.

ACTOR, in general, fignifies a perfon who acts or performs fomething.

ACTOR, among Civilians, the proctor or advocate in civil courts or caufes: as, *Actor ecclefiæ* has been fometimes ufed for the advocate of the church; *actor dominicus* for the lord's attorney; *actor villæ*, the fteward or head bailiff of a village.

ACTOR, in the drama, is a perfon who reprefents fome part or character upon the theatre. The drama confifted originally of nothing more than a fimple chorus, who fung hymns in honour of Bacchus; fo that the primitive actors were only fingers and muficians. Thefpis was the firft that, in order to eafe this unformed chorus, introduced a declaimer, who repeated fome heroic or comic adventure. Æfchylus, finding a fingle perfon tirefome, attempted to introduce a fecond, and changed the ancient recitals into dialogues. He alfo dreffed his actors in a more majeftic manner, and introduced the cothurnus or bufkin. Sophocles added a third, in order to reprefent the various incidents in a more natural manner: and here the Greeks ftopped, at leaft we do not find in any of their tragedies above three perfons in the fame fcene. Perhaps they looked upon it as a rule of the dramatic poem, never to admit more than three fpeakers at a time on the ftage; a rule which Horace has expreffed in the following verfe:

Nec quarta loqui perfona laboret.

This, however, did not prevent their increafing the number of actors in comedy. Before the opening of a play, they named their actors in full theatre, together with the parts they were to perform. The ancient actors were mafked, and obliged to raife their voice extremely, in order to make themfelves heard by the innumerable crowd of people who filled the amphitheatres: they were accompanied with a player on the flute, who played a prelude, gave them the tone, and played while they declaimed. Horace fpeaks of a kind of fecondary actors, in his time, whofe bufinefs was to imitate the firft; and leffen themfelves, to become better foils to their principals.

The moderns have introduced an infinite number of actors upon the ftage. This heightens the trouble and diftrefs that fhould reign there, and makes a diverfity, in which the fpectator is fure to be interefted.

Actors were highly honoured at Athens. At Rome they were defpifed, and not only denied all rank among the citizens, but even when any citizen appeared upon the ftage he was expelled his tribe and deprived of the right of fuffrage by cenfors. Cicero, indeed, efteems the talents of Rofcius: but he values his virtues ftill more; virtues which diftinguifhed him fo remarkably above all others of his profeffion, that they feemed to have excluded him from the theatre. The French have, in this refpect, adopted the ideas of the Romans; and the Englifh thofe of the Greeks.

ACTOR, the name of feveral perfons in fabulous hiftory.

ftory. One *Actor* among the Aurunci is defcribed by Virgil as an hero of the firft rank. *Æn.* xii.

ACTORUM TABULÆ, in antiquity, were tables inftituted by Servius Tullius, in which the births of children were regiftered. They were kept in the treafury of Saturnus.

ACTRESS, in a general fenfe, a female who acts or performs fomething.

ACTRESS, in the drama, a female performer. Women actors were unknown to the ancients, among whom men always performed the female character; and hence one reafon for the ufe of mafks among them.

Actreffes are faid not to have been introduced on the Englifh ftage till after the reftoration of king Charles II. who has been charged with contributing to the corruption of our manners by importing this ufage from abroad. But this can be but partly true: the queen of James I. acted a part in a paftoral; and Prynn, in his Hiftriomaftix, fpeaks of women actors in his time as whores; which was one occafion of the fevere profecution brought againft him for that book.

There are fome very agreeable and beautiful talents, of which the poffeffion commands a certain fort of admiration; but of which the exercife for the fake of gain is confidered, whether from reafon or prejudice, as a fort of public proftitution. The pecuniary recompence, therefore, of thofe who exercife them in this manner, muft be fufficient, not only to pay for the time, labour, and expence of acquiring the talents, but for the difcredit which attends the employment of them as the means of fubfiftence. The exorbitant rewards of players, opera-fingers, opera-dancers, &c. are founded upon thofe two principles; the rarity and beauty of the talents, and the difcredit of employing them in this manner. It feems abfurd at firft fight that we fhould defpife their perfons, and yet reward their talents with the moft profufe liberality. While we do the one, however, we muft of neceffity do the other. Should the public opinion or prejudice ever alter with regard to fuch occupations, their pecuniary recompence would quickly diminifh. More people would apply to them, and the competition would quickly reduce the price of their labour. Such talents, though far from being common, are by no means fo rare as is imagined. Many people poffefs them in great perfection, who difdain to make this ufe of them; and many more are capable of acquiring them, if any thing could be made honourably by them.

ACTUAL, fomething that is real and effective, or that exifts truly and abfolutely. Thus philofophers ufe the terms *actual* heat, *actual* cold, &c. in oppofition to *virtual* or *potential*. Hence, among phyficians, a red-hot iron, or fire, is called an *actual* cautery; in diftinction from cauterics, or cauftics, that have the power of producing the fame effect upon the animal folids as actual fire, and are called *potential* cauteries. Boiling water is actually hot; brandy, producing heat in the body, is potentially hot, though of itfelf cold.

ACTUAL Sin, that which is committed by the perfon himfelf; in oppofition to *original* fin, or that which he contracted from being a child of Adam.

ACTUARIÆ NAVES, a kind of fhips among the Romans, chiefly defigned for fwift failing.

ACTUARIUS, a celebrated Greek phyfician, of the 13th century, and the firft Greek author who has treated of mild purgatives, fuch as caffia, manna, fena, &c. His works were printed in one volume folio, by Henry Stephens, in 1567.

ACTUARIUS, or ACTARIUS, a notary or officer appointed to write the acts or proceedings of a court, or the like. In the Eaftern Empire, the actuarii were properly officers who kept the military accounts, received the corn from the *fufceptores* or ftore-keepers, and delivered it to the foldiers.

ACTUATE, to bring into act, or put a thing in action. Thus an agent is faid, by the fchoolmen, to *actuate* a power, when it produces an act in a fubject. And thus the mind may be faid to *actuate* the body.

ACTUS, in ancient architecture, a meafure in length equal to 120 Roman feet. In ancient agriculture, the word fignified the length of one furrow, or the diftance a plough goes before it turns.

ACTUS Minimus, was a quantity of land 120 feet in length, and four in breadth.

ACTUS Major, or *ACTUS Quadratus*, a piece of ground in a fquare form, whofe fide was equal to 120 feet, equal to half the jugerum.

ACTUS Intervicenalis, a fpace of ground four feet in breadth, left between the lands as a path or way.

ACUANITES, in ecclefiaftical hiftory, the fame with thofe called more frequently MANICHEES. They took the name from Acua, a difciple of Thomas one of the twelve apoftles.

ACULEATE, or ACULEATI, a term applied to any plant or animal armed with prickles.

ACULEI, the prickles of animals or of plants.

ACULER, in the manege, is ufed for the motion of a horfe, when, in working upon volts, he does not go far enough forward at every time or motion, fo that his fhoulders embrace or take in too little ground, and his croupe comes too near the centre of the volt. Horfes are naturally inclined to this fault in making demi-volts.

ACUMINA, in antiquity, a kind of military omen, moft generally fuppofed to have been taken from the points or edges of darts, fwords, or other weapons.

ACUNA (Chriftopher de), a Spanifh Jefuit, born at Burgos. He was admitted into the fociety in 1612, being then but 15 years of age. After having devoted fome years to ftudy, he went to America, where he affifted in making converts in Chili and Peru. In 1640, he returned to Spain, and gave the king an account how far he had fucceeded in the commiffion he had received to make difcoveries on the river of the Amazons; and the year following he publifhed a defcription of this river, at Madrid. Acuna was fent to Rome, as procurator of his province. He returned to Spain with the title of Qualificator of the Inquifition; but foon after embarked again for the Weft Indies, and was at Lima in 1675, when father Southwell publifhed at Rome the Bibliotheque of the Jefuit writers. Acuna's work is intitled, *Nuevo defcubrimento del gran rio de las Amazonas*; *i. e.* "A new difcovery of the great river of the Amazons." He was ten months together upon this river, having had inftructions to inquire into every thing with the greateft exactnefs, that his majefty might thereby be enabled to render the navigation more

more eaſy and commodious. He went aboard a ſhip at Quito with Peter Texiera, who had already been ſo far up the river, and was therefore thought a proper perſon to accompany him in this expedition. They embarked in February 1639, but did not arrive at Para till the December following. It is thought that the revolutions of Portugal, by which the Spaniards loſt all Braſil, and the colony of Para at the mouth of the river of the Amazons, were the cauſe that the relation of this Jeſuit was ſuppreſſed; for as it could not be of any advantage to the Spaniards, they were afraid it might prove of great ſervice to the Portugueſe. The copies of this work became extremely ſcarce, ſo that the publiſhers of the French tranſlation at Paris aſſerted, that there was not one copy of the original extant, excepting one in the poſſeſſion of the tranſlator, and, perhaps, that in the Vatican library. M. de Gomberville was the author of this tranſlation: it was publiſhed after his death, with a long diſſertation. An account of the original may be ſeen in the Paris Journal, in that of Leipſic, and in Chevereau's Hiſtory of the World.

ACUPUNCTURE, the name of a ſurgical operation among the Chineſe and Japaneſe, which is performed by pricking the part affected with a ſilver needle. They employ this operation in headachs, lethargies, convulſions, colics, &c.

ACUS, in ichthyology, the trivial name of a ſpecies of ſyngnathus. See SYNGNATHUS.

ACUSIO COLONIA, now ANCONE, according to Holſtenius, between Orange and Valence, near Montelimart, on the banks of the Rhone.

ACUTE, an epithet applied to ſuch things as terminate in a ſharp point or edge. And in this ſenſe it ſtands oppoſed to obtuſe.

ACUTE Angle, in geometry, is that which is leſs than a right angle, or which does not ſubtend 90 degrees.

ACUTE-angled Triangle, is a triangle whoſe three angles are all acute.

ACUTE-angled Cone is, according to the ancients, a right cone, whoſe axis makes an acute angle with its ſide.

ACUTE, in muſic, is applied to a ſound or tone that is ſharp or high, in compariſon of ſome other tone. In this ſenſe, *acute* ſtands oppoſed to *grave*.

ACUTE Accent. See ACCENT.

ACUTE Diſeaſes, ſuch as come ſuddenly to a criſis. This term is uſed for all diſeaſes which do not fall under the head of chronic diſeaſes.

ACUTIATOR, in writers of the barbarous ages, denotes a perſon that whets or grinds cutting inſtruments; called alſo in ancient gloſſaries, *acutor*, ακονητης, *ſamiarius*, *cobarius*, &c. In the ancient armies there were acutiatores, a kind of ſmiths, retained for whetting or keeping the arms ſharp.

AD, a Latin prepoſition, originally ſignifying *to*, and frequently uſed in compoſition both with and without the *d*, to expreſs the relation of one thing to another.

AD Beſtias, in antiquity, is the puniſhment of criminals condemned to be thrown to wild beaſts.

AD Hominem, in logic, a kind of argument drawn from the principles or prejudices of thoſe with whom we argue.

AD Ludos, in antiquity, a ſentence upon criminals among the Romans, whereby they were condemned to entertain the people by fighting either with wild beaſts, or with one another, and thus executing juſtice upon themſelves.

AD Metalla, in antiquity, the puniſhment of ſuch criminals as were condemned to the mines, among the Romans; and therefore called *Metallici*.

AD Valorem, a term chiefly uſed in ſpeaking of the duties or cuſtoms paid for certain goods: The duties on ſome articles are paid by the number, weight, meaſure, tale, &c.; and others are paid *ad valorem*, that is, according to their value.

ADAGE, a proverb, or ſhort ſentence, containing ſome wiſe obſervation or popular ſaying. Eraſmus has made a very large and valuable collection of the Greek and Roman adages; and Mr Ray has done the ſame with regard to the Engliſh. We have alſo Kelly's collection of Scots Proverbs.

ADAGIO, in muſic. Adverbially, it ſignifies *ſoftly, leiſurely*; and is uſed to denote the ſloweſt of all times. Uſed ſubſtantively, it ſignifies a ſlow movement. Sometimes this word is repeated, as *adagio, adagio*, to denote a ſtill greater retardation in the time of the muſic.

ADALIDES, in the Spaniſh policy, are officers of juſtice, for matters touching the military forces. In the laws of king Alphonſus, the adalides are ſpoken of as officers appointed to guide and direct the marching of the forces in time of war. Lopez repreſents them as a ſort of judges, who take cogniſance of the differences ariſing upon excurſions, the diſtribution of plunder, &c.

ADAM, the firſt of the human race, was formed by the Almighty on the ſixth day of the creation. His body was made of the duſt of the earth; after which, God animated or gave it life, and Adam then became a rational creature.—His heavenly Parent did not leave his offspring in a deſtitute ſtate to ſhift for himſelf; but planted a garden, in which he cauſed to grow not only every tree that was proper for producing food, but likewiſe ſuch as were agreeable to the eye, or merely ornamental. In this garden were aſſembled all the brute creation; and, by their Maker, cauſed to paſs before Adam, who gave all of them names, which were judged proper by the Deity himſelf.—In this review, Adam found none for a companion to himſelf. This ſolitary ſtate was ſeen by the Deity to be attended with ſome degree of unhappineſs; and therefore he threw Adam into a deep ſleep, in which condition he took a rib from his ſide, and healing up the wound formed a woman of the rib he had taken out. On Adam's awaking, the woman was brought to him; and he immediately knew her to be one of his own ſpecies, called her his bone and his fleſh, giving her the name of *woman* becauſe ſhe was taken out of man.

The firſt pair being thus created, God gave them authority over the inferior creation, commanding them to ſubdue the earth, alſo to increaſe and multiply and fill it. They were informed of the proper food for the beaſts and for them; the graſs, or green herbs, being appointed for beaſts; and fruits, or ſeeds, for man. Their proper employment alſo was aſſigned them; namely, *to dreſs the garden, and to keep it*.

Though Adam was thus highly favoured and inſtructed

Adam.

ted by his Maker, there was a ſingle tree, which grew in the middle of the garden, of the fruit of which they were not allowed to eat; being told, that they ſhould ſurely die in the day they eat of it. This tree was named, *the Tree of the Knowledge of Good and Evil.* This prohibition, however, they ſoon broke through. The woman having entered into converſation with *the Serpent*, was by him perſuaded, that by eating of the tree ſhe ſhould become as wiſe as God himſelf; and accordingly, being invited by the beauty of the fruit, and its deſirable property of imparting wiſdom, ſhe plucked and eat; giving her huſband of it at the ſame time, who did likewiſe eat.

Before this tranſgreſſion of the divine command, Adam and his wife had no occaſion for clothes, neither had they any ſenſe of ſhame; but immediately on eating the forbidden fruit, they were aſhamed of being naked, and made aprons of fig-leaves for themſelves. On hearing the voice of God in the garden, they were terrified, and hid themſelves: but being queſtioned by the Deity, they confeſſed what they had done, and received ſentence accordingly; the man being condemned to labour; the woman to ſubjection to her huſband, and to pain in child-bearing. They were now driven out of the garden, and their acceſs to it prevented by a terrible apparition. They had clothes given them by the Deity made of the ſkins of beaſts. In this ſtate Adam had ſeveral children; the names of only three of whom we are acquainted with, *viz.* Cain, Abel, and Seth. He died at the age of 930 years.

Theſe are all the particulars concerning Adam's life, that we have on divine authority: but a vaſt multitude of others are added by the Jews, Mahometans, and Papiſts; all of which muſt be at beſt conjectural; moſt of them, indeed, appear downright falſehoods or abſurdities. The curioſity of our readers, it is preſumed, will be ſufficiently gratified by the few which are here ſubjoined.

According to the Talmudiſts, when Adam was created, his body was of immenſe magnitude. When he ſinned, his ſtature was reduced to an hundred ells, according to ſome; to nine hundred cubits, according to others; who think this was done at the requeſt of the angels, who were afraid of ſo gigantic a creature. In the iſland of Ceylon is a mountain, called the *Peak* or mountain of Adam, from its being, according to the tradition of the country, the reſidence of our firſt parent. Here the print of his footſteps, above two palms in length, are ſtill pointed out.

Many reveries have been formed concerning the perſonal beauty of Adam. That he was a handſome well-ſhaped man is probable; but ſome writers, not content with this, affirm, that God, intending to create man, clothed Himſelf with a perfectly beautiful human body, making this his model in the formation of the body of Adam.

Nor has the imagination been leſs indulged concerning the formation of the human ſpecies male and female.—It would be endleſs to recount all the whimſies that have been wrote on this ſubject; but as Mad. Bourignon has made a conſiderable figure in the *religious*, or rather *ſuperſtitious* world, we cannot help inſerting ſome of her opinions concerning the firſt man, which are peculiarly marvellous. According to the *revelations* of this lady, Adam before his fall poſſeſſed in himſelf the principles of both ſexes, and the virtue or power of producing his like, without the concurrent aſſiſtance of woman. The diviſion into two ſexes, ſhe imagined*, was a conſequence of man's ſin; and now, ſhe obſerves, mankind are become ſo many *monſters in nature*, being much leſs perfect in this reſpect than plants or trees, who are capable of producing their like alone, and without pain or miſery. She even imagined, that, being in an ecſtaſy, ſhe ſaw the figure of Adam before he fell, with the manner how, by himſelf, he was capable of procreating other men. "God," ſays ſhe, "repreſented to my mind the beauty of the firſt world, and the manner how he had drawn it from the chaos: every thing was bright, tranſparent, and darted forth light and ineffable glory. The body of Adam was purer and more tranſparent than cryſtal, and vaſtly fleet; through this body were ſeen veſſels and rivulets of light, which penetrated from the inward to the outward parts, through all his pores. In ſome veſſels ran fluids of all kinds and colours, vaſtly bright, and quite diaphanous. The moſt raviſhing harmony aroſe from every motion; and nothing reſiſted, or could annoy, him. His ſtature was taller than the preſent race of men; his hair was ſhort, curled, and of a colour inclining to black; his upper lip covered with ſhort hair: and inſtead of the beſtial parts which modeſty will not allow us to name, he was faſhioned as our bodies will be in the life eternal, which I know not whether I dare reveal. In that *region* his noſe was formed after the manner of a *face*, which diffuſed the moſt delicious fragrancy and perfumes; whence alſo men were to iſſue, all whoſe principles were inherent in him; there being in his belly a veſſel, where little eggs were formed; and a ſecond veſſel filled with a fluid, which impregnated thoſe eggs: and when man heated himſelf in the love of God, the deſire he had that other creatures ſhould exiſt beſides himſelf, to praiſe and love God, cauſed the fluid abovementioned (by means of the fire of the love of God) to drop on one or more of theſe eggs, with inexpreſſible delight; which being thus impregnated, iſſued, ſome time after, out of man, by this canal†, in the ſhape of an egg, whence a perfect man was hatched by inſenſible degrees. Woman was formed by taking out of Adam's ſides the veſſels that contained the eggs; which ſhe ſtill poſſeſſes, as is diſcovered by anatomiſts."

* Preface to a book intitled, *Le nouveau ciel et la nouvelle terre*, Amſt. 1679.

† *i. e.* the *naſal* canal, ſituated as above deſcribed.

Many others have believed, that Adam at his firſt creation was both male and female: others, that he had two bodies joining together at the ſhoulders, and their faces looking oppoſite ways like thoſe of Janus. Hence, ſay theſe, when God created Eve, he had no more to do than to ſeparate the two bodies from one another‡. Of all others, however, the opinion of Paracelſus ſeems the moſt ridiculous‖. *Negabat primos parentes ante lapſum habuiſſe partes generationi hominis neceſſarias; credebat poſtea acceſſiſſe, ut ſtrumam gutturi.*

‡ See *Androgynes.*

‖ Paracelſus *apud* Voſſium *de philoſophia*, c. ix. p. 71.

Extravagant things are aſſerted concerning Adam's knowledge. It is very probable that he was inſtructed by the Deity how to accompliſh the work appointed him, *viz.* to dreſs the garden, and keep it from being deſtroyed by the brute creatures; and it is alſo probable that he had likewiſe every piece of knowledge communicated to him that was either neceſſary or pleaſing: but that he was acquainted with geometry, mathematics, rhetoric, poetry, painting, ſculpture, &c. is too ridiculous to be credited by any ſober perſon. Some

rabbies, indeed, have contented themſelves with equalling Adam's knowledge to that of Moſes and Solomon; while others, again, have maintained that he excelled the angels themſelves. Several Chriſtians ſeem to be little behind theſe Jews in the degree of knowledge they aſcribed to Adam; nothing being hid from him, according to them, except contingent events relating to futurity. One writer indeed (Pinedo) excepts politics; but a Carthuſian friar, having exhauſted, in favour of Ariſtotle, every image and compariſon he could think of, at laſt aſſerted that Ariſtotle's knowledge was as extenſive as that of *Adam*.—In conſequence of this ſurpriſing knowledge with which Adam was endued, he is ſuppoſed to have been a conſiderable author. The Jews pretend that he wrote a book on the creation, and another on the Deity. Some rabbies aſcribe the 92[d] pſalm to Adam; and in ſome manuſcripts the Chaldee title of this pſalm expreſsly declares that this is the ſong of praiſe which the firſt man repeated for the ſabbath-day.

Various conjectures have been formed concerning the place where man was firſt created, and where the garden of Eden was ſituated; but none of theſe have any ſolid foundation. The Jews tell us, that Eden was ſeparated from the reſt of the world by the ocean; and that Adam, being baniſhed therefrom, walked acroſs the ſea, which he found every way fordable, by reaſon of his enormous ſtature*. The Arabians imagined paradiſe to have been in the air; and that our firſt parents were thrown down from it on their tranſgreſſion, as Vulcan is ſaid to have been thrown down headlong from heaven by Jupiter.

* This is juſt the picture of the Orion or Polyphemus of the poets. *Æneid.* iii. 663, 664. x. 763.

Strange ſtories are told concerning Adam's children. That he had none in the ſtate of innocence, is certain from ſcripture; but that his marriage with Eve was not conſummated till after the fall, cannot be proved from thence. Some imagine, that, for many years after the fall, Adam denied himſelf the connubial joys by way of penance; others, that he cohabited with another woman, whoſe name was LILITH. The Mahometans tell us, that our firſt parents having been thrown headlong from the celeſtial paradiſe, Adam fell upon the iſle of Serendib, or Ceylon, in the Eaſt-Indies; and Eve on Iodda, a port of the Red Sea, not far from Mecca. After a ſeparation of upwards of 200 years, they met in Ceylon, where they multiplied: according to ſome Eve had twenty, according to others only eight, deliveries; bringing forth at each time twins, a male and a female, who afterwards married. The Rabbins imagine that Eve brought forth Cain and Abel at a birth; that Adam wept for Abel an hundred years in the valley of tears near Hebron, during which time he did not cohabit with his wife; and that this ſeparation would probably have continued longer, had it not been forbid by the angel Gabriel. The inhabitants of Ceylon affirm, that the ſalt lake on the mountain of Colembo conſiſts wholly of the tears which Eve for one hundred years together ſhed becauſe of Abel's death.

Some of the Arabians tell us, that Adam was buried near Mecca on Mount Abukobeis; others, that Noah, having laid his body in the ark, cauſed it to be carried after the deluge to Jeruſalem by Melchiſedek the ſon of Shem: of this opinion are the eaſtern Chriſtians; but the Perſians affirm that he was interred in the iſle of Serendib, where his corps was guarded by lions at the time the giants warred upon one another.—St Jerom imagined that Adam was buried at Hebron; others, on Mount Calvary. Some are of opinion that he died on the very ſpot where Jeruſalem was afterwards built; and was buried on the place where Chriſt ſuffered, that ſo his bones might be ſprinkled with the Saviour's blood!!!

ADAM (Melchior) lived in the 17[th] century. He was born in the territory of Grotkaw in Sileſia, and educated in the college of Brieg, where the dukes of that name, to the utmoſt of their power, encouraged learning and the reformed religion as profeſſed by Calvin. Here he became a firm Proteſtant; and was enabled to purſue his ſtudies by the liberality of a perſon of quality, who had left ſeveral exhibitions for young ſtudents. He was appointed rector of a college at Heidelberg, where he publiſhed his firſt volume of illuſtrious men in the year 1615. This volume, which conſiſted of philoſophers, poets, writers on polite literature, and hiſtorians, &c. was followed by three others; that which treated of divines was printed in 1619; that of the lawyers came next; and, finally, that of the phyſicians: the two laſt were publiſhed in 1620. All the learned men, whoſe lives are contained in theſe four volumes, lived in the 16[th], or beginning of the 17[th] century, and are either Germans or Flemings; but he publiſhed in 1618 the lives of twenty divines of other countries in a ſeparate volume. All his divines are Proteſtants. The Lutherans were not pleaſed with him, for they thought him partial; nor will they allow his work to be a proper ſtandard whereby to judge of the learning of Germany. He wrote other works beſides his lives, and died in 1622.

ADAM's Apple, a name given to a ſpecies of CITRUS.

ADAM's Needle. See YUCCA.

ADAM's Peak, a high mountain of the Eaſt Indies, in the iſland of Ceylon, on the top of which they believe the firſt man was created. See ADAM.

ADAM, or ADOM, a town in the Peræa, or on the other ſide the Jordan, over-againſt Jericho, where the Jordan began to be dried up on the paſſage of the Iſraelites; (Joſhua.)

ADAMA, or ADMAH, one of the towns that were involved in the deſtruction of Sodom; (Moſes.)

ADAMANT, a name ſometimes given to the diamond. (See DIAMOND.) It is likewiſe applied to the ſcoriæ of gold, the magnet, &c.

ADAMIC EARTH, a name given to common red clay, alluding to that ſpecies of earth of which the firſt man is ſuppoſed to have been made.

ADAMI POMUM, in anatomy, a protuberance in the fore-part of the throat, formed by the os hyoides. It is thought to be ſo called upon a ſtrange conceit, that a piece of the forbidden apple, which Adam eat, ſtuck by the way, and occaſioned it.

ADAMITES, in eccleſiaſtical hiſtory, the name of a ſect of ancient heretics, ſuppoſed to have been a branch of the Baſilidians and Carpocratians.

Epiphanius tells us, that they were called Adamites from their pretending to be re-eſtabliſhed in the ſtate of innocence, and to be ſuch as Adam was at the moment of his creation, whence they ought to imitate him in his nakedneſs. They deteſted marriage; maintaining, that the conjugal union would never have taken place upon earth had ſin been unknown.

This obscure and ridiculous sect did not at first last long; but it was revived, with additional absurdities, in the twelfth century, by one Tandamus, since known by the name of *Tanchelin*, who propagated his errors at Antwerp, in the reign of the emperor Henry V. He maintained, that there ought to be no distinction between priests and laymen, and that fornication and adultery were meritorious actions. Tanchelin had a great number of followers, and was constantly attended by 3000 of these profligates in arms. His sect did not, however, continue long after his death: but another appeared under the name of *Turlupins*, in Savoy and Dauphiny, where they committed the most brutal actions in open day.

About the beginning of the fifteenth century, one Picard, a native of Flanders, spread these errors in Germany and Bohemia, particularly in the army of the famous Zisca, notwithstanding the severe discipline he maintained. Picard pretended that he was sent into the world as a new Adam, to re-establish the law of nature; and which, according to him, consisted in exposing every part of the body, and having all the women in common. This sect found also some partizans in Polland, Holland, and England: they assembled in the night; and it is asserted, that one of the fundamental maxims of their society was contained in the following verse:

Jura, perjura, secretum prodere noli.

ADAMUS, the philosopher's stone is so called by alchemists; they say it is an animal, and that it has carried its invisible *Eve* in its body, since the moment they were united by the Creator.

ADAMSHIDE, a district of the circle of Rastenburg, belonging to the king of Prussia, which, with Dombrosken, was bought, in 1737, for 42,000 dollars.

ADAMSON (Patrick), a Scottish prelate, archbishop of St Andrews. He was born in the year 1543 in the town of Perth, where he received the rudiments of his education; and afterwards studied Philosophy, and took his degree of master of arts at the university of St Andrews. In the year 1566, he set out for Paris, as tutor to a young gentleman. In the month of June of the same year, Mary queen of Scots being delivered of a son, afterwards James VI. of Scotland and First of England, Mr Adamson wrote a Latin poem on the occasion. This proof of his loyalty involved him in some difficulties, having been confined in France for six months; nor would he have easily got off, had not Queen Mary, and some of the principal nobility, interested themselves in his behalf. As soon as he recovered his liberty, he retired with his pupil to Bourges. He was in this city during the massacre at Paris; and the same persecuting spirit prevailing among the catholics at Bourges as at the metropolis, he lived concealed for seven months in a public house, the master of which, upwards of 70 years of age, was thrown from the top thereof, and had his brains dashed out, for his charity to heretics. Whilst Mr Adamson lay thus in his sepulchre, as he called it, he wrote his Latin poetical version of the Book of Job, and his Tragedy of Herod in the same language. In the year 1573, he returned to Scotland; and, having entered into holy orders, became minister of Paisley. In the year 1575, he was appointed one of the commissioners, by the general assembly, to settle the jurisdiction and policy of the church; and the following year he was named, with Mr David Lindsay, to report their proceedings to the earl of Mortoun, then regent. About this time the earl made him one of his chaplains; and, on the death of bishop Douglas, promoted him to the archiepiscopal see of St Andrew's, a dignity which brought upon him great trouble and uneasiness: for now the clamour of the Presbyterian party rose very high against him, and many inconsistent absurd stories were propagated concerning him. Soon after his promotion, he published his catechism in Latin verse, a work highly approved even by his enemies; but, nevertheless, they still continued to persecute him with great violence. In 1578, he submitted himself to the general assembly, which procured him peace but for a very little time; for, the year following, they brought fresh accusations against him. In the year 1582, being attacked with a grievous disease, in which the physicians could give him no relief, he happened to take a simple medicine from an old woman, which did him service. The woman, whose name was Alison Pearson, was thereupon charged with witchcraft, and committed to prison, but escaped out of her confinement; however, about four years afterwards, she was again found and burnt for a witch. In 1583, king James came to St Andrew's; and the archbishop, being much recovered, preached before him, and disputed with Mr Andrew Melvil, in presence of his Majesty, with great reputation, which drew upon him fresh calumny and persecution. The king, however, was so well pleased with him, that he sent him embassador to Queen Elisabeth, at whose court he resided for some years. His conduct, during his embassy, has been variously reported by different authors. Two things he principally laboured, *viz.* the recommending the king his master to the nobility and gentry of England, and the procuring some support for the episcopal party in Scotland. By his eloquent preaching, he drew after him such crowds of people, and raised in their minds such a high idea of the young king his master, that queen Elizabeth forbad him to enter the pulpit during his stay in her dominions. In 1584, he was recalled, and sat in the parliament held in August at Edinburgh. The Presbyterian party was still very violent against the archbishop. A provincial synod was held at St Andrew's in April 1586: the archbishop was here accused and excommunicated: he appealed to the king and the states, but this availed him little; for the mob being excited against him, he durst scarce appear in public. At the next general assembly, a paper being produced, containing the archbishop's submission, he was absolved from the excommunication. In 1588, fresh accusations were brought against him. The year following, he published the Lamentations of the prophet Jeremiah in Latin verse; which he dedicated to the king, complaining of his hard usage. In the latter end of the same year, he published a translation of the Apocalypse, in Latin verse; and a copy of Latin verses, addressed also to his Majesty, when he was in great distress. The king, however, was so far from giving him assistance, that he granted the revenue of his see to the duke of Lennox; so that the remaining part of this prelate's life was very wretched, he having hardly subsistence for his family. He died in 1591.

ADANA, a town of Asia, in Natolia, and in the province

province of Carmania. It is feated on the river Choquen; on the banks of which ftands a ftrong little caftle built on a rock. It has a great number of beautiful fountains brought from the river by means of waterworks. Over the river there is a ftately bridge of fifteen arches, which leads to the water-works. The climate is very pleafant and healthy, and the winter mild and ferene: but the fummer is fo hot as to oblige the principal inhabitants to retire into the neighbouring mountains, where they fpend fix months among fhady trees and grottoes, in a moft delicious manner. The adjacent country is rich and fertile, and produces melons, cucumbers, pomegranates, pulfe, and herbs of all forts, all the year round; befides corn, wine, and fruits in their proper feafon. It is 30 miles eaft of Tarfus, on the road to Aleppo. E. long. 35. 42. N. lat. 38. 10.

ADANSONIA, Ethiopian Sour-gourd, Monkies-bread, or African Calabash-tree, a genus of the monodelphia order, belonging to the polyandria clafs of plants; the characters of which are: The *calyx* is a perianthium one-leav'd, half five-cleft, cup-form, (the divifions revolute), deciduous: The *corolla* confifts of five petals, roundifh, nerved, revolute, growing reciprocally with the claws and ftamina: The *ftamina* have numerous filaments, coalefced beneath into a tube, and crowning it, expanding horizontally; the antheræ kidney-form, incumbent: The *piftillum* has an egged germ; the ftylus very long, tubular, varioufly intorted; the ftigmata numerous (10) prifmatic, villous, ray-expanded: The *pericarpium* is an oval capfule, woody, not gaping, 10-celled, with farinaceous pulp, the partitions membranous: The *feeds* are numerous, kidney-fhaped, rather bony, and involved in a friable pulp.

There is at prefent but one known fpecies belonging to this genus, the Baobab, which is perhaps the largeft production of the whole vegetable kingdom. It is a native of Africa.

The trunk is not above 12 or 15 feet high, but from 65 to 78 feet round. The loweft branches extend almoft horizontally; and as they are about 60 feet in length, their own weight bends their extremities to the ground, and thus form an hemifpherical mafs of verdure of about 120 or 130 feet diameter. The roots extend as far as the branches: that in the middle forms a pivot, which penetrates a great way into the earth; the reft fpread near the furface. The flowers are in proportion to the fize of the tree: and are followed by an oblong fruit, pointed at both ends, about 10 inches long, five or fix broad, and covered with a kind of greenifh down, under which is a ligneous rind, hard and almoft black, marked with rays which divide it lengthwife into fides. The fruit hangs to the tree by a pedicle two feet long and an inch diameter. It contains a whitifh fpongy juicy fubftance; with feeds of a brown colour, and fhaped like a kidney-bean. The bark of this tree is nearly an inch thick, of an afh-coloured grey, greafy to the touch, bright, and very fmooth: the outfide is covered with a kind of varnifh; and the infide is green, fpeckled with red. The wood is white, and very foft; the firft fhoots of the year are green and downy.

The leaves of the young plants are entire, of an oblong form, about four or five inches long, and almoft three broad towards the top, having feveral veins running from the middle rib; they are of a lucid green colour. As the plants advance in height, the leaves alter, and are divided into three parts, and afterwards into five lobes, which fpread out in the fhape of an hand. The tree fheds its leaves in November, and new ones begin to appear in June. It flowers in July, and the fruit ripens in October and November. It is very common in Senegal, and the Cape de Verd iflands; and is found 100 leagues up the country at Gulam, and upon the fea-coaft as far as Sierra-leona.

The age of this tree is perhaps no lefs remarkable than its enormous fize. Mr Adanfon relates, that in a botanical excurfion to the Magdalene Iflands, in the neighbourhood of Goree, he difcovered fome calabafh-trees, from five to fix feet diameter, on the bark of which were engraved or cut to a confiderable depth a number of European names. Two of thefe names, which he was at the trouble to repair, were dated one the 14th, the other the 15th century. The letters were about fix inches long, but in breadth they occupied a very fmall part only of the circumference of the trunk: from whence he concluded they had not been cut when thefe trees were young. Thefe infcriptions, however, he thinks fufficient to determine pretty nearly the age which thefe calabafh-trees may attain; for even fuppofing that thofe in queftion were cut in their early years, and that trees grew to the diameter of fix feet in two centuries, as the engraved letters evince, how many centuries muft be requifite to give them a diameter of 25 feet, which perhaps is not the laft term of their growth! The infcribed trees mentioned by this ingenious Frenchman had been feen in 1555, almoft two centuries before, by Thevet, who mentions them in the relation of his voyage to Terra Antarctica or Auftralis. Adanfon faw them in 1749.

The virtues and ufes of this tree and its fruit are various. The negroes of Senegal dry the bark and leaves in the fhaded air; and then reduce them to powder, which is of a pretty good green colour. This powder they preferve in bags of linen or cotton, and call it *lillo*. They ufe it every day, putting two or three pinches of it into a mefs, whatever it happens to be, as we do pepper and falt: but their view is, not to give a relifh to their food, but to preferve a perpetual and plentiful perfpiration, and to attemper the too great heat of the blood; purpofes which it certainly anfwers, as feveral Europeans have proved by repeated experiments, preferving themfelves from the epidemic fever, which, in that country, deftroys Europeans like the plague, and generally rages during the months of September and October, when, the rains having fuddenly ceafed, the fun exhales the water left by them upon the ground, and fills the air with a noxious vapour. M. Adanfon, in that critical feafon, made a light ptifan of the leaves of the baobab, which he had gathered in the Auguft of the preceding year, and had dried in the fhade; and drank conftantly about a pint of it every morning, either before or after breakfaft, and the fame quantity of it every evening after the heat of the fun began to abate; he alfo fometimes took the fame quantity in the middle of the day, but this was only when he felt fome fymptoms of an approaching fever. By this precaution he preferved himfelf, during the five years he refided at Senegal, from the diarrhœa and fever, which are fo fatal there, and

and which are, however, the only dangerous diſeaſes of the place; and other officers ſuffered very ſeverely, only one excepted, upon whom M. Adanſon prevailed to uſe this remedy, which for its ſimplicity was deſpiſed by the reſt. This ptiſan alone alſo prevents that heat of urine which is common in theſe parts, from the month of July to November, provided the perſon abſtains from wine.

The fruit is not leſs uſeful than the leaves and the bark. The pulp that envelopes the ſeeds has an agreeable acid taſte, and is eaten for pleaſure: it is alſo dried and powdered, and thus uſed medicinally in peſtilential fevers, the dyſentery, and bloody flux; the doſe is a drachm, paſſed through a fine ſieve, taken either in common water, or in an infuſion of the plantain. This powder is brought into Europe under the name of *terra ſigillata lemnia*. The woody bark of the fruit, and the fruit itſelf when ſpoiled, helps to ſupply the negroes with an excellent ſoap, which they make by drawing a ley from the aſhes, and boiling it with palm-oil that begins to be rancid.

The trunks of ſuch of theſe trees as are decayed, the negroes hollow out into burying places for their poets, muſicians, buffoons: perſons of theſe characters they eſteem greatly while they live, ſuppoſing them to derive their ſuperior talents from ſorcery or a commerce with demons; but they regard their bodies with a kind of horror when dead, and will not give them burial in the uſual manner, neither ſuffering them to be put into the ground, nor thrown into the ſea or any river, becauſe they imagine that the water would not then nouriſh the fiſh, nor the earth produce its fruits. The bodies ſhut up in theſe trunks become perfectly dry without rotting, and form a kind of mummies without the help of embalment.

The baobab is very diſtinct from the calabaſh-tree of America, with which it has been confounded by father Labat. See CRESCENTIA.

Culture. This tree is propagated from ſeeds, which are brought from the countries where they grow naturally. Being natives only of hot climates, the plants will not thrive in the open air in Britain, even in ſummer. The ſeeds are therefore to be ſown in pots, and plunged into a hot-bed, where the plants will appear in about ſix weeks, and in a ſhort time after be fit to tranſplant. They muſt then be planted each in a ſeparate pot, in light ſandy earth, and plunged into a hot-bed, ſhading them until they have taken root: after which they ſhould have freſh air admitted every day in warm weather: but muſt be ſparingly watered, as being apt to rot. They grow quickly for two or three years, but afterwards make little progreſs; the lower part of the ſtem then begins to ſwell, and put out lateral branches, inclining to a horizontal poſition, and covered with a light grey bark.——Some of this kind of plants were raiſed from ſeeds obtained from Grand Cairo by Dr William Sherard, in 1724, and were grown to the height of 18 feet; but were all deſtroyed by the ſevere froſt in 1740; after which they were unknown in Britain till the return of Mr Adanſon to Paris in 1754.

ADAPTERS, or ADOPTERS. See CHEMISTRY, (*Index*.)

ADAR, the name of a Hebrew month, anſwering to the end of February and beginning of March, the 12th of their ſacred, and 6th of their civil year. On the 7th day of it, the Jews keep a feaſt for the death of Moſes; on the 13th, they have the feaſt of Eſther; and on the 14th, they celebrate the feaſt of Purim, for their deliverance from Haman's conſpiracy.—As the lunar year, which the Jews followed in their calculations, is ſhorter than the ſolar by about 11 days, which at the end of three years make a month, they then intercalate a 13th month, which they call *Veadar*, or the *ſecond Adar*.

ADARCE, a kind of concreted ſalts found on reeds and other vegetables, and applied by the ancients as a remedy in ſeveral cutaneous diſeaſes.

ADARCON, in Jewiſh antiquity, a gold coin mentioned in ſcripture, worth about 15s. ſterling.

ADARME, in commerce, a ſmall weight in Spain, which is alſo uſed at Buenos-Aires, and in all Spaniſh America. It is the 16th part of an ounce, which at Paris is called the *demi-gros*. But the Spaniſh ounce is ſeven *per cent*. lighter than that of Paris. Stephens renders it in Engliſh by a *dram*.

ADATAIS, ADATSI, or ADATYS, in commerce, a muſlin or cotton-cloth, very fine and clear, of which the piece is ten French ells long, and three quarters broad. It comes from the Eaſt-Indies; and the fineſt is made at Bengal.

ADCORDABILIS DENARII, in old law books, ſignify money paid by the vaſſal to his lord, upon the ſelling or exchanging of a feud.

ADCRESCENTES, among the Romans, denoted a kind of ſoldiery, entered in the army, but not yet put on duty; from theſe the ſtanding forces were recruited. See ACCENSI.

ADDA, in geography, a river of Switzerland and Italy, which riſes in mount Braulio, in the country of the Griſons, and, paſſing through the Valteline, traverſes the lake Como and the Milaneſe, and falls into the Po, near Cremona.

ADDEPHAGIA, in medicine, a term uſed by ſome phyſicians, for gluttony, or a voracious appetite.

ADDER, in zoology, a name for the VIPER. See COLUBER.

ADDER-Bolts, or *Adder-flies*. See LIBELULLA.

Sea-ADDER, the Engliſh name of a ſpecies of SYNGNATHUS.

Water-ADDER, a name given to the COLUBER *Natrix*.

ADDER-ſtung, is uſed in reſpect of cattle, when ſtung with any kind of venomous reptiles, as adders, ſcorpions, &c. or bit by a hedge-hog or ſhrew.—For the cure of ſuch bites, ſome uſe an ointment made of dragon's blood, with a little barley-meal, and the whites of eggs.

ADDER-Wort, or *Snakewood*. See POLYGONUM.

ADDEXTRATORES, in the court of Rome, the pope's mitre-bearers, ſo called, according to Ducange, becauſe they walk at the Pope's right-hand when he rides to viſit the churches.

ADDICE, or ADZE, a kind of crooked ax uſed by ſhip-wrights, carpenters, coopers, &c.

ADDICTI, in antiquity, a kind of ſlaves, among the Romans, adjudged to ſerve ſome creditor whom they could not otherwiſe ſatisfy, and whoſe ſlaves they became till they could pay or work out the debt.

ADDICTION, among the Romans, was the making

king over goods to another, either by sale, or by legal sentence; the goods so delivered were called *bona addicta*. Debtors were sometimes delivered over in the same manner; and thence called *servi addicti*.

ADDICTIO IN DIEM, among the Romans, the adjudging a thing to a person for a certain price, unless by such a day the owner, or some other, give more for it.

ADDISON (Lancelot), son of Lancelot Addison a clergyman, was born at Mouldismeaburne, in the parish of Crosby Ravensworth in Westmoreland, in the year 1632. He was educated at Queen's College, Oxford; and at the Restoration of king Charles II. accepted of the chaplainship of the garrison of Dunkirk: but that fortress being delivered up to the French in 1662, he returned to England, and was soon after made chaplain to the garrison of Tangier; where he continued seven years, and was greatly esteemed. In 1670, he returned to England, and was made chaplain in ordinary to the king; but his chaplainship of Tangier being taken from him on account of his absence, he found himself straitened in his circumstances, when he seasonably obtained the rectory of Milston in Wiltshire, worth about 120l. *per annum*. He afterwards became a prebendary of Sarum; took his degree of doctor of divinity at Oxford; and in 1683 was made dean of Litchfield, and the next year archdeacon of Coventry. His life was exemplary; his conversation pleasing, and greatly instructive; and his behaviour as a gentleman, a clergyman, and a neighbour, did honour to the place of his residence. He wrote, 1. A Short Narrative of the Revolutions of the Kingdoms of Fez and Morocco: 2. The present History of the Jews: 3. A Discourse on Catechising: 4. A Modest Plea for the Clergy: 5. An Introduction to the Sacrament: 6. The first State of Mahometism: and several other pieces. This worthy divine died on the 20th of April 1703 and left three sons: Joseph, the subject of the next article; Gulston, who died while governor of Fort St George; Lancelot, master of arts, and fellow of Magdalen College in Oxford; and one daughter, first married to Dr Sartre prebendary of Westminster, and afterwards to Daniel Combes, Esq.

ADDISON (Joseph), son of dean Addison the subject of the last article. He was born at Milston, near Ambresbury, in Wiltshire, on the 11th of May 1672; and not being thought likely to live, was baptized the same day. He received the first rudiments of his education at the place of his nativity, under the reverend Mr Naish; but was soon removed to Salisbury, under the care of Mr Taylor; and from thence to the charter-house, where he commenced his acquaintance with Sir Richard Steele. About fifteen, he was entered at Queen's College, Oxford, where he applied very closely to the study of classical learning, in which he made a surprising proficiency.

In the year 1687, Dr Lancaster, dean of Magdalen College, having, by chance, seen a Latin poem of Mr Addison's, was so pleased with it, that he immediately got him elected into that house, where he took up his degrees of bachelor and master of arts. His Latin pieces in the course of a few years, were exceedingly admired in both universities; nor were they less esteemed abroad, particularly by the celebrated Boileau, who is reported to have said, that he would not have written against Perrault, had he before seen such excellent pieces by a modern hand. He published nothing in English before the twenty-second year of his age; when there appeared a short copy of verses written by him, and addressed to Mr Dryden, which procured him great reputation from the best judges. This was soon followed by a translation of the Fourth Georgic of Virgil, (omitting the story of Aristæus), much commended by Mr Dryden. He wrote also the Essay on the Georgics, prefixed to Mr Dryden's translation. There are several other pieces written by him about this time; amongst the rest, one dated the 3d of April 1694, addressed to H. S. that is, Dr Sacheverel, who became afterwards so famous, and with whom Mr Addison lived once in the greatest friendship; but their intimacy was some time after broken off by their disagreement in political principles. In the year 1695, he wrote a poem to king William on one of his campaigns, addressed to Sir John Somers lord keeper of the great seal. This gentleman received it with great pleasure, took the author into the number of his friends, and bestowed on him many marks of his favour.

Mr Addison had been closely pressed, while at the university, to enter into holy orders; and had once resolved upon it: but his great modesty, his natural diffidence, and an uncommonly delicate sense of the importance of the sacred function, made him afterwards alter his resolution; and having expressed an inclination to travel, he was encouraged thereto by his patron above-mentioned, who by his interest procured him from the crown a pension of L. 300 *per annum* to support him in his travels. He accordingly made a tour to Italy in the year 1699; and, in 1701, he wrote a poetical epistle from Italy to the earl of Halifax, which has been universally esteemed as a most excellent performance. It was translated into Italian verse by the abbot Antonio Maria Salvini, Greek professor at Florence. In the year 1705, he published an account of his travels, dedicated to lord Somers; which, though at first but indifferently received, yet in a little time met with its deserved applause.

In the year 1702, he was about to return to England, when he received advice of his being appointed to attend prince Eugene, who then commanded for the emperor in Italy: but the death of king William happening soon after, put an end to this affair as well as his pension; and he remained for a considerable time unemployed. But an unexpected incident at once raised him, and gave him an opportunity of exerting his fine talents to advantage: for in the year 1704, the lord treasurer Godolphin happened to complain to lord Halifax, that the duke of Marlborough's victory at Blenheim had not been celebrated in verse in the manner it deserved; and intimated, that he would take it kindly, if his lordship, who was the known patron of the poets, would name a gentleman capable of doing justice to so elevated a subject. Lord Halifax replied, somewhat hastily, that he did know such a person, but would not mention him; adding, that long had he seen, with indignation, men of no merit maintained in luxury at the public expence, whilst those of real worth and modesty were suffered to languish in obscurity. The treasurer answered very coolly, that he was sorry there should be occasion for such an observation, but that he would do his endeavour to wipe off such reproaches for the

Addifon. the future; and he engaged his honour, that whoever his lordfhip named, as a perfon capable of celebrating this victory, fhould meet with a fuitable recompence. Lord Halifax thereupon named Mr Addifon; infifting, however, that the treafurer himfelf fhould fend to him; which he promifed. Accordingly he prevailed on Mr Boyle (afterwards lord Carlton) then chancellor of the exchequer, to make the propofal to Mr Addifon; which he did in fo polite a manner, that our author readily undertook the tafk. The lord-treafurer had a fight of the piece, when it was carried no farther than the celebrated fimile of the angel; and was fo pleafed with it, that he immediately appointed Mr Addifon a commiffioner of appeals, vacant by the promotion of Mr Locke, chofen one of the lords commiffioners for trade. The Campaign is addreffed to the duke of Marlborough; it gives a fhort view of the military tranfactions in 1704, and contains a noble defcription of the two great actions at Schellemberg and Blenheim. In 1705, he attended lord Halifax to Hanover; and the enfuing year was appointed under-fecretary to Sir Charles Hedges fecretary of ftate; in which office he acquitted himfelf fo well, that the earl of Sunderland, who fucceeded Sir Charles in December, continued Mr Addifon in his employment.

A tafte for operas beginning at this time to prevail in England, and many perfons having folicited Mr Addifon to write one, he complied with their requeft, and compofed his Rofamond. This, however, whether from the defect of the mufic, or from the prejudices in favour of the Italian tafte, did not fucceed upon the ftage; but the poetry of it has, and always will be, juftly admired. About this time, Sir Richard Steele compofed his comedy of the Tender Hufband, to which Mr Addifon wrote a prologue. Sir Richard furprifed him with a dedication of this play, and acquainted the public, that he was indebted to him for fome of the moft excellent ftrokes in the performance. The marquis of Wharton, being appointed lord lieutenant of Ireland in 1709, took Mr Addifon with him as his fecretary. Her majefty alfo made him keeper of the records of Ireland, and, as a farther mark of her favour, confiderably augmented the falary annexed to that place. Whilft he was in this kingdom, the Tatler was firft publifhed; and he difcovered his friend Sir Richard Steele to be the author, by an obfervation on Virgil, which he had communicated to him. He afterwards affifted confiderably in carrying on this paper, which the author acknowledges. The Tatler being laid down, the Spectator was fet on foot, and Mr Addifon furnifhed great part of the moft admired papers. The Spectator made its firft appearance in March 1711, and was brought to a conclufion in September 1712.

His celebrated Cato appeared in 1713. He formed the defign of a tragedy upon this fubject when he was very young, and wrote it when on his travels: he retouched it in England, without any intention of bringing it on the ftage; but his friends being perfuaded it would ferve the caufe of liberty, he was prevailed on by their folicitations, and it was accordingly exhibited on the theatre, with a prologue by Mr Pope, and an epilogue by Dr Garth. It was received with the moft uncommon applaufe, having run thirty-five nights without interruption. The Whigs applauded every line in which liberty was mentioned, as a fatire on the Tories; and the Tories echoed every clap, to fhow that the fatire was unfelt. When it was printed, notice was given that the Queen would be pleafed if it was dedicated to her; "but as he had defigned that compliment elfewhere, he found himfelf obliged," fays Tickell, "by his duty on the one hand, and his honour on the other, to fend it into the world without any dedication." It was no lefs efteemed abroad, having been tranflated into French, Italian, and German; and it was acted at Leghorn, and feveral other places, with vaft applaufe. The Jefuits of St Omers made a Latin verfion of it, and the ftudents acted it with great magnificence.

About this time, another paper called the Guardian was publifhed by Steele, to which Addifon was a principal contributor. It was a continuation of the Spectator, and was diftinguifhed by the fame elegance and the fame variety; but, in confequence of Steele's propenfity to politics, was abruptly difcontinued in order to write the Englifhman.

The papers of Addifon are marked in the Spectator by one of the letters in the name of *Clio*, and in the Guardian by a *Hand*. Many of thefe papers were written with powers truly comic, with nice difcrimination of characters, and accurate obfervation of natural or accidental deviations from propriety: but it was not fuppofed that he had tried a comedy on the ftage, till Steele, after his death, declared him the author of "The Drummer." This, however, he did not know to be true by any cogent teftimony: for when Addifon put the play into his hands, he only told him it was the work of a gentleman in the company; and when it was received, as is confeffed, with cold difapprobation, he was probably lefs willing to claim it. Tickell omitted it in his collection; but the teftimony of Steele, and the total filence of any other claimant, has determined the public to affign it to Addifon, and it is now printed with his other poetry. Steele carried "The Drummer" to the playhoufe, and afterwards to the prefs, and fold the copy for 50 guineas. To Steele's opinion may be added the proof fupplied by the play itfelf, of which the characters are fuch as Addifon would have delineated, and the tendency fuch as Addifon would have promoted.

It is faid that Mr Addifon intended to have compofed an Englifh dictionary upon the plan of the Italian (Della Crufca); but, upon the death of the queen, being appointed fecretary to the lords juftices, he had not leifure to carry on fuch a work. When the earl of Sunderland was appointed lord lieutenant of Ireland, Mr Addifon was again made fecretary for the affairs of that kingdom; and, upon the earl's being removed from the lieutenancy, he was chofen one of the lords of trade.

Not long afterwards an attempt was made to revive the Spectator, at a time indeed by no means favourable to literature, when the fucceffion of a new family to the throne filled the nation with anxiety, difcord, and confufion; and either the turbulence of the times or the fatiety of the readers put a ftop to the publication, after an experiment of 80 numbers, which were afterwards collected into an eighth volume, perhaps more valuable than any of thofe that went before it: Addifon produced more than a fourth part.

In

Addison.

In 1715, he began the Freeholder, a political paper, which was much admired, and proved of great use at that juncture. He published also, about this time, verses to Sir Godfrey Kneller upon the king's picture, and some to the princess of Wales with the tragedy of Cato.

Before the arrival of king George he was made secretary to the regency, and was required by his office to send notice to Hanover that the queen was dead, and that the throne was vacant. To do this would not have been difficult to any man but Addison, who was so overwhelmed with the greatness of the event, and so distracted by choice of expression, that the lords, who could not wait for the niceties of criticism, called Mr Southwell, a clerk in the house, and ordered him to dispatch the message. Southwell readily told what was necessary, in the common style of business, and valued himself upon having done what was too hard for Addison.

In 1716, he married the countess dowager of Warwick, whom he had solicited by a very long and anxious courtship. He is said to have first known her by becoming tutor to her son. The marriage, if uncontradicted report can be credited, made no addition to his happiness; it neither found them nor made them equal. She always remembered her own rank, and thought herself intitled to treat with very little ceremony the tutor of her son. It is certain that Addison has left behind him no encouragement for ambitious love. The year after, 1717, he rose to his highest elevation, being made secretary of state; but is represented as having proved unequal to the duties of his place. In the house of commons he could not speak, and therefore was useless to the defence of the government. In the office he could not issue an order without losing his time in quest of fine expressions. At last, finding by experience his own inability for public business, he was forced to solicit his dismission, with a pension of 1500 l. a-year. Such was the account of those who were inclined to detract from his abilities; but by others his relinquishment was attributed to declining health, and the necessity of recess and quiet.

In his retirement, he applied himself to a religious work *, which he had begun long before; part of which, scarce finished, has been printed in his works. He intended also to have given an English paraphrase of some of David's psalms. But his ailments increased, and cut short his designs. He had for some time been oppressed by an asthmatic disorder, which was now aggravated by a dropsy, and he prepared to die conformably to his precepts and professions. He sent, as Pope relates, a message by the earl of Warwick to Mr Gay, desiring to see him: Gay, who had not visited him for some time before, obeyed the summons, and found himself received with great kindness. The purpose for which the interview had been solicited was then discovered: Addison told him, that he had injured him; but that, if he recovered, he would recompense him. What the injury was he did not explain, nor did Gay ever know; but supposed that some preferment designed for him had by Addison's intervention been withheld.—Another death-bed interview, of a more solemn nature, is recorded: Lord Warwick was a young man of very irregular life, and perhaps of loose opinions. Addison, for whom he did not want respect, had very diligently endeavoured to reclaim him; but his arguments and expostulations had no effect: One experiment, however, remained to be tried. When he found his life near its end, he directed the young lord to be called: and when he desired, with great tenderness, to hear his last injunctions, told him, "I have sent for you that "you may see how a Christian can die." What effect this awful scene had on the earl's behaviour is not known: he died himself in a short time. Having given directions to Mr Tickell for the publication of his works, and dedicated them on his death-bed to his friend Mr Craggs, he died June 17. 1719, at Holland-house, leaving no child but a daughter who is still living.

* Evidences of the Xian Religion.

Addison's course of life before his marriage has been detailed by Pope. He had in the house with him Budgell, and perhaps Philips. His chief companions were Steele, Budgell, Philips, Carey, Davenant, and Colonel Brett. With one or other of these he always breakfasted. He studied all morning; then dined at a tavern, and went afterwards to Button's. From the coffeehouse he went again to the tavern, where he often sat late, and drank too much wine.

Dr Johnson, in delineating the character of Addison, observes with Tickell, that he employed wit on the side of virtue and religion. He not only made the proper use of wit himself, but taught it to others; and from his time it has been generally subservient to the cause of reason and truth. He has dissipated the prejudice that had long connected gaiety with vice, and easiness of manners with laxity of principles. He has restored virtue to its dignity, and taught innocence not to be ashamed. This is an elevation of literary character, "above all Greek, above all Roman fame." No greater felicity can genius attain than that of having purified intellectual pleasure, separated mirth from indecency, and wit from licentiousness; of having taught a succession of writers to bring elegance and gaiety to the aid of goodness; and, to use expressions yet more awful, of having "turned many to righte- "ousness." As a describer of life and manners, he must be allowed to stand perhaps the first of the first rank. His humour, which, as Steele observes, is peculiar to himself, is so happily diffused as to give the grace of novelty to domestic scenes and daily occurrences. He never "outsteps the modesty of nature," nor raises merriment or wonder by the violation of truth. His figures neither divert by distortion, nor amaze by aggravation. He copies life with so much fidelity, that he can be hardly said to invent; yet his exhibitions have an air so much original, that it is difficult to suppose them not merely the product of imagination. As a teacher of wisdom he may be confidently followed. His religion has nothing in it enthusiastic or superstitious; he appears neither weakly credulous nor wantonly sceptical; his morality is neither dangerously lax nor impracticably rigid. All the enchantment of fancy and all the cogency of argument are employed to recommend to the reader his real interest, the care of pleasing the Author of his being. Truth is shown sometimes as the phantom of a vision, sometimes appears half-veiled in an allegory; sometimes attracts regard in the robes of fancy, and sometimes steps forth in the confidence of reason. She wears a thousand dresses, and in all is pleasing.

The

Addifon.

The Doctor, however, has related the following anecdote, which every admirer of Addifon, every man of feeling, muft be reluctant to believe. "Steele (fays the Doctor), whofe imprudence of generofity, or vanity of profufion, kept him always incurably neceffitous, upon fome preffing exigence, in an evil hour, borrowed an hundred pounds of his friend, probably without much purpofe of repayment; but Addifon, who feems to have had other notions of a hundred pounds, grew impatient of delay, and reclaimed his loan by an execution. Steele felt, with great fenfibility, the obduracy of his creditor; but with emotions of forrow rather than of anger." It is much to be wifhed, fays Dr Kippis, that Dr Johnfon had produced his authority for this narration. It is very poffible, that it may be only a ftory the Doctor had fomewhere heard in converfation, and which is entirely groundlefs: "and this I am the rather inclined to believe, as I have been affured, by one of the moft refpectable characters in the kingdom, that the fact hath no foundation in truth." Mr Potter, in a late publication, hath informed us, that he is told by the beft authority, that the ftory is an abfolute falfehood.

Mr Tyers, in "An hiftorical Effay on Mr Addifon," printed, but not publifhed, has mentioned fome facts concerning him, with which we were not before acquainted. Thefe are, That he was laid out for dead as foon as he was born: that, when he addreffed his verfes on the Englifh poets to Henry Sacheverell, he courted that gentleman's fifter: that, whenever Jacob Tonfon came to him for the Spectator, Bayle's French Hiftorical and Critical Dictionary lay always open before him: that, upon his return to England, after his travels, he difcharged fome old debts he had contracted at Oxford, with the generofity of good intereft: that he was put into plentiful circumftances by the death of a brother in the Eaft Indies: that, having received encouragement from a married lady, of whom he had been formerly enamoured, he had the integrity to refift the temptation: that he refufed a gratification of a three hundred pounds bank-note, and afterwards of a diamond-ring of the fame value, from a Major Dunbar, whom he had endeavoured to ferve in Ireland by his intereft with lord Sunderland: and that his daughter by lady Warwick is ftill alive and unmarried, refiding at Bilton near Rugby, and poffeffing an income of more than twelve hundred a-year.

The following letter, which probably relates to the cafe of Major Dunbar, reflects great honour on Mr Addifon's integrity. "*June* 26. 1715. Sir, I find there is a very ftrong oppofition formed againft you; but I fhall wait on my lord lieutenant this morning, and lay your cafe before him as advantageoufly as I can, if he is not engaged in other company. I am afraid what you fay of his grace does not portend you any good. And now, Sir, believe me, when I affure you I never did, nor ever will, on any pretence whatfoever, take more than the ftated and cuftomary fees of my office. I might keep the contrary practice concealed from the world, were I capable of it, but I could not from myfelf; and I hope I fhall always fear the reproaches of my own heart more than thofe of all mankind. In the mean time, if I can ferve a gentleman of merit, and fuch a character as you bear in the world, the fatisfaction I meet with on fuch an occafion is always a fufficient, and the only reward to, Sir, your moft obedient, humble fervant, J. Addison."—The anecdote which follows was told by the late Dr Birch. Addifon and Mr Temple Stanyan were very intimate. In the familiar converfations which paffed between them, they were accuftomed freely to difpute each other's opinions. Upon fome occafion, Mr Addifon lent Stanyan five hundred pounds. After this, Mr Stanyan behaved with a timid referve, deference, and refpect; not converfing with the fame freedom as formerly, or canvaffing his friend's fentiments. This gave great uneafinefs to Mr Addifon. One day they happened to fall upon a fubject, on which Mr Stanyan had always been ufed ftrenuoufly to oppofe his opinion. But, even upon this occafion, he gave way to what his friend advanced, without interpofing his own view of the matter. This hurt Mr Addifon fo much, that he faid to Mr Stanyan, "Either contradict me, or pay me the money."

In Tickell's edition of Mr Addifon's works there are feveral pieces hitherto unmentioned, viz. The Differtation on Medals; which, though not publifhed till after his death, yet he had collected the materials, and began to put them in order, at Vienna, in 1702. A pamphlet, intitled, The prefent State of the War, and the Neceffity of an Augmentation, confidered. The late Trial and Conviction of Count Tariff. The Whig Examiner came out on the 14th of September 1716: there were five of thefe papers attributed to Mr Addifon, and they are the fevereft pieces he ever wrote. He is faid alfo to have been the author of a performance intitled *Differtatio de infignioribus Romanorum Poetis*, and of a Difcourfe on Ancient and Modern Learning.

Additament || Additions of place.

ADDITAMENT, fomething added to another. Thus phyficians call the ingredients added to a medicine already compounded, *additaments*.

ADDITION, is the joining together or uniting two or more things, or augmenting a thing by the acceffion of others thereto.

Addition, in Arithmetic, Algebra, &c. See thefe articles.

Addition, in mufic, a dot marked on the right fide of a note, fignifying that it is to be founded or lengthened half as much more as it would have been without fuch mark.

Addition, in law, is that name or title which is given to a man over and above his proper name and furname, to fhow of what eftate, degree, or myftery he is; and of what town, village, or country.

Additions of Eftate, or *Quality*, are, Yeoman, Gentleman, Efquire, and fuch like.

Additions of Degree, are thofe we call names of dignity; as Knight, Lord, Earl, Marquis, and Duke.

Additions of Myftery, are fuch as fcrivener, painter, mafon, and the like.

Additions of Place, are, of Thorp, of Dale, of Woodftock.—Where a man hath houfehold in two places, he fhall be faid to dwell in both; fo that his addition in either may fuffice. Knave was anciently a regular addition. By ftat. 1. Hen. V. cap. 5. it was ordained, that in fuch fuits or actions where procefs of outlawry lies, fuch addition fhould be made to the name of the defendant, to fhow his eftate, myftery, and place where he dwells; and that the writs not having

ving such additions shall abate if the defendant take exception thereto; but not by the office of the court. The reason of this ordinance was, that one man might not be troubled by the outlawry of another; but by reason of the certain addition, every person might bear his own burden.

ADDITIONS, in distilling, a name given to such things as are added to the wash, or liquor, while in a state of fermentation, in order to improve the vinosity of the spirit, procure a larger quantity of it, or give it a particular flavour. All things, of whatever kind, thus added in the time of fermentation, are called by those of the business who speak most intelligently *additions*; but many confound them with things of a very different nature, under the name of *ferments*. See DISTILLING.

ADDITIONS, in heraldry, some things added to a coat of arms, as marks of honour; and therefore directly opposite to abatements. Among additions we reckon BORDURE, QUARTER, CANTON, GYRON, PILE, &c. See these articles.

ADDRESS, in a general sense, is used for skill and good management, and of late has been adopted from the French. It is used also in commerce, as synonymous with direction to a person or place. The word is formed of the French verb *adresser*, *To direct any thing to a person*.

ADDUCENT MUSCLES, or ADDUCTORS, in anatomy, those muscles which pull one part of the body towards another. See ANATOMY, *Table of the Muscles*.

ADEB, in commerce, the name of a large Egyptian weight, used principally for rice, and consisting of 210 okes, each of three rotolos, a weight of about two drams less than the English pound. But this is no certain weight; for at Rosetto the adeb is only 150 okes.

ADEL, a kingdom on the eastern coast of Africa, which reaches as far as the straits of Babelmandel, which unite the Red Sea to the sea of Arabia. This country produces corn, and feeds a great number of cattle. The inhabitants carry on a trade in gold, silver, ivory, oil, frankincense, a sort of pepper, and other merchandises of Arabia and the Indies. The king was formerly a vassal to the grand negus of Abyssinia: but being Mahometans, and the Abyssinians a sort of Christians, they could not agree; and in 1535 came to an open rupture, when the Adelines threw off the yoke, seeking protection from the Grand Signior. The principal places are, Adela, seated in the centre of the country, and is the town where the king resides: Zeila, near the Arabian Sea, is a rich town, and has a good trade: Barbora, near the sea-coast, is an ancient trading town. It rains very seldom in this country.

ADELIA, a genus of the monadelphia order, belonging to the dioecia class of plants; the characters of which are: The MALE *calyx* is a perianthium one-leaved, three-parted; the florets sublanced and concave: No *corolla*: The *stamina* consist of many capillary filaments the length of the calyx, conjoined at the base in a cylinder; the antheræ are roundish. The FEMALE *calyx* is a five-leaved perianthium; the leaflets sublanced, concave, persistent: No *corolla*: The *pistillum* has a roundish germen; the styli are three, short, and divaricated; the stigmata lacerated: The *perianthium* is a three-grained, roundish, three-celled capsule: The *seeds* are solitary and roundish. In the natural method, this genus belongs to the 38th order, Tricoccæ. Of this genus there are three species; the *bernardia*, the *ricinella*, and *acidoton*, for which we have no proper names in English. They are natives of Jamaica, and are akin to the ricinus or croton, and may be propagated in hot-beds from seeds procured from Jamaica.

ADELME, or ALDHELM, son to Kenred, nephew to Ina king of the West-Saxons; after having been educated abroad, was abbot of Malmsbury 30 years. He was the first Englishman who wrote in Latin, the first who brought poetry into England, and the first bishop of Sherburn. He lived in great esteem till his death, which happened in 709. He was canonized, and many miracles were told of him. He is mentioned with great honour by Camden and Bayle, and his life was written by William of Malmsbury.

ADELPHIANI, in church-history, a sect of ancient heretics, who fasted always on Sundays.

ADELSCALC, in ancient customs, denotes a servant of the king. The word is also written *adelscalche*, and *adelscalcus*. It is compounded of the German *anel*, or *edel*, "noble," and *scalc*, "servant." Among the Bavarians, *adelscalcs* appear to have been the same with royal *thanes* among the Saxons, and those called *ministri regis* in ancient charters.

ADEMPTION, in the civil law, implies the revocation of a grant, donation, or the like.

ADEN, formerly a rich and considerable town of Arabia the Happy. It is seated by the sea-side, a little eastward of the straits of Babelmandel.

ADENANTHERA, BASTARD FLOWER-FENCE, a genus of the monogynia order, belonging to the decandria class of plants. In the natural method, it belongs to the 33d order, *Lomentaceæ*. The characters are: The *calyx* is a perianthium consisting of one very small five-toothed leaf. The *corolla* consists of five bell-shaped lanceolate sessile petals, convex within and concave under. The *stamina* have ten erect subulated filaments shorter than the corolla; the antheræ are roundish, incumbent, bearing a globular gland on the exterior top. The *pistillum* has a long gibbous germen; the stylus subulated the length of the stamina; the stigma simple. The *pericarpium* is a long compressed membranous legumen. The *seeds* are very numerous, roundish, and remote.

Only one species of this plant is known in Britain: but there is a variety, with scarlet seeds; which, however, is rare, and grows very slowly. It is a native of India, and rises to a considerable height. It is as large as the tamarind tree; spreads its branches wide on every side, and makes a fine shade; for which reason, it is frequently planted by the inhabitants in their gardens or near their habitations. The leaves of this tree are doubly winged, the flowers of a yellow colour, and disposed in a long bunch. These are succeeded by long twisted membranaceous pods, inclosing several hard compressed seeds, of a beautiful scarlet, or shining black, colour. This plant must be raised in a hot-bed, and kept during winter in a stove.

ADENBURG, or ALDENBURG, a town of Westphalia, and in the duchy of Burg, subject to the Elector Palatine. It is 12 miles N. E. of Cologne, and 17 W. of Bonn; E. long. 7. 25. lat. 51. 2.

ADENOGRAPHY, that part of anatomy which treats of the glandular parts. See ANATOMY.

ADENOIDES, glandulous, or of a glandular form; an epithet applied to the PROSTATÆ.

ADENOLOGY, the ſame with Adenography.

ADENOS, a kind of cotton, otherwiſe called *marine cotton*. It comes from Aleppo by the way of Marſeilles, where it pays 20 *per cent.* duty.

ADEONA, in mythology, the name of a goddeſs invoked by the Romans when they ſet out upon a journey.

ADEPHAGIA, in mythology, the goddeſs of gluttony, to whom the Sicilians paid religious worſhip.

ADEPS, in anatomy, the fat found in the abdomen. It alſo ſignifies animal fat of any kind.

ADEPTS, a term among alchemiſts for thoſe who pretended to have found the panacea or philoſophers-ſtone.

ADERBIJAN, a province of Perſia, bounded on the N. by Armenia Proper, on the S. by Irac-Agemi, on the E. by Ghilan, and on the W. by Curdiſtan. The principal town is Tauris; from 42. to 48. long. from 36. to 39. lat.

ADERNO, a ſmall place in the Val di Demona in the kingdom of Sicily: E. long. 15. 25. lat. 28. 5. The ancient ADRANUM.

ADES, or HADES, denotes the inviſible ſtate. In the heathen mythology, it comprehends all thoſe regions that lie beyond the river Styx, viz. Erebus, Tartarus, and Elyſium. See HELL.

ADESSENARIANS, ADESSENARII, in church-hiſtory, a ſect of Chriſtians who hold the real preſence of Chriſt's body in the euchariſt, though not by way of tranſubſtantiation. They differ conſiderably as to this preſence; ſome holding that the body of Chriſt is in the bread; others that it is about the bread; and others that it is under the bread.

ADFILIATION, a Gothic cuſtom, whereby the children of a former marriage are put upon the ſame footing with thoſe of the ſecond. This is alſo called *unio prolium*, and ſtill retained in ſome parts of Germany.

AD FINES (Antonine), a town of Swiſſerland, ſuppoſed to be the modern *Pfin*, in the north of the diſtrict of Turgow, on the rivulet Thur, not far from the borders of Suabia, about half-way between Conſtance and Frauenfield. So called, becauſe when Cecinna, general of the emperor Vitellius, with the auxiliary Rhetians, defeated the Helvetii, the former extended their borders thus far, their territory ending here; and, in time of the Romans, it was the laſt town in this quarter, and of ſome repute.

ADHA, a feſtival which the Mahometans celebrate on the 10th day of the month *Dhoulhegiat*, which is the 12th and laſt of their year. This month being particularly deſtined for the ceremonies which the pilgrims obſerve at Mecca, it takes its name from thence, for the word ſignifies *the month of Pilgrimage*. On that day they ſacrifice with great ſolemnity, at Mecca, and no where elſe, a ſheep, which is called by the ſame name as the feſtival itſelf. The Turks commonly call this feſtival the *Great Beiram*, to diſtinguiſh it from the leſſer, which ends their faſt, and which the Chriſtians of the Levant call the *Eaſter of the Turks*. The Mahometans celebrate this feſtival, out of the city of Mecca, in a neighbouring valley; and ſometimes they ſacrifice there a camel. See BAIRAM.

ADHATODA, in botany. See JUSTICIA.

ACTION OF ADHERENCE, in Scots law; an action competent to a huſband or wife, to compel either party to adhere, in caſe of deſertion.

ADHESION, in a general ſenſe, implies the ſticking or adhering of bodies together.

ADHESION, in philoſophy. See COHESION.

ADHESION, in anatomy, a term for one part ſticking to another, which in a natural ſtate are ſeparate. For the moſt part, if any of thoſe parts in the thorax or belly lie in contact, and inflame, they grow together. The lungs very frequently adhere to the pleura.

ADHIL, in aſtronomy, a ſtar of the ſixth magnitude, upon the garment of Andromeda, under the laſt ſtar in her foot.

ADHOA, in ancient cuſtoms, denotes what we otherwiſe call *relief*. In which ſenſe we ſometimes alſo find the word written *adoha*, *adhoamentum*, and *adhogamentum*.

ADIANTHUM, MAIDEN-HAIR; a genus of the order of filices, belonging to the cryptogamia claſs of plants. The fructifications are collected in oval ſpots under the reflected tops of the fronds.

Species. Of this genus botanical writers enumerate fifteen ſpecies; the moſt remarkable are the following: 1. The capillus veneris, or true maiden-hair, is a native of the ſouthern parts of France, from whence it is brought to Britain; though it is likewiſe ſaid to grow plentifully in Cornwall, and the Trichomanes has been almoſt univerſally ſubſtituted for it. 2. The pedatum, or American maiden-hair, is a native of Canada; and grows in ſuch quantities, that the French ſend it from thence in package for other goods, and the apothecaries of Paris uſe it for maiden-hair in the compoſitions wherein that is ordered. 3. The trapeziforme, or black American maiden-hair, is a native of Jamaica; and has ſhining black ſtalks, and leaves of an odd ſhape, which make an agreeable variety among other plants, ſo is ſometimes cultivated in gardens.

Culture. The firſt ſpecies grows naturally out of the joints of walls, and fiſſures of rocks. It ought therefore to be planted in pots filled with gravel and lime-rubbiſh; where it will thrive much better than in good earth. It muſt alſo be ſheltered under a frame during the winter.—The ſecond is to be treated in the ſame manner; but the third will not thrive in Britain, unleſs kept in a ſtove during the winter.

Properties. The true maiden-hair has been greatly celebrated in diſorders of the breaſt proceeding from a thinneſs and acrimony of the juices; and likewiſe for opening obſtructions of the viſcera, and promoting the expectoration of tough phlegm. But modern practice pays little regard to it; the aſplenium trichomanes, or Engliſh maiden-hair, ſupplying its place. See ASPLENIUM.

ADIAPHORISTS, in church-hiſtory, a name importing lukewarmneſs, given, in the 16th century, to the moderate Lutherans, who embraced the opinions of Melancthon, whoſe diſpoſition was vaſtly more pacific than that of Luther.

ADIAPHOROUS, ADIAPHORUS, a name given by Mr Boyle to a kind of ſpirit diſtilled from tartar and ſome other vegetable bodies; and which is neither acid, vinous, nor urinous; but in many reſpects different from any other ſort of ſpirit.

ADJAZZO, ADRAZZO, or AJACCIO, in geography, a

a handsome town and castle of Corsica in the Mediterranean, with a bishop's see, and a good harbour. It is populous, and fertile in wine. It is 27 miles S. W. of Corte. E. long. 41. 54 lat. 38. 5.

ADJECTIVE, in grammar, a kind of noun joined with a substantive, either expressed or implied, to show its qualities or accidents. See GRAMMAR.

ADIGE, a river in Italy, which taking its rise south of the lake Glace among the Alps, runs south by Trent, then east by Verona in the territory of Venice, and falls into the gulph of Venice, north of the mouth of the Po.

ADJOURNMENT, the putting off a court, or other meeting, till another day. There is a difference between the adjournment and the prorogation of the parliament; the former not only being for a shorter time, but also done by the house itself; whereas the latter is an act of royal authority.

ADIPOSE, a term used by anatomists for any cell, membrane, &c. that is remarkable for its fatness.

ADIRBEITSAN, in geography, a province of Persia, in Asia, and part of the ancient Media. It is bounded on the N. by the province of Shirvan, on the S. by Irac-Agemi and Curdistan, on the E. by Gilan and the Caspian sea, and on the W. by Turcomania.

ADIT, in a general sense, the passage to, or entrance of, any thing.

Adit of a Mine, the hole, or aperture, whereby it is entered and dug, and by which the water and ores are carried away. The term amounts to the same with *cuniculus* or *drift*, and is distinguished from *air-shaft*. The adit is usually made on the side of a hill, towards the bottom thereof, about four, five, or six feet high, and eight wide, in form of an arch; sometimes cut in the rock, and sometimes supported with timber, so conducted as that the sole or bottom of the adit may answer to the bottom of the shaft, only somewhat lower, that the water may have a sufficient current to pass away without the use of the pump. Damps and the impurity of the air are the great impediments against driving adits above 20 or 30 fathoms, by reason of the necessity, in this case, of letting down air-shafts from the day to meet the adit, which are often very expensive, both on account of the great depth of mines, and the hardness of the mineral strata to be cut through. The best remedy against this is that practised in the coal-mines near Liege, where they work their adits without air-shafts: the manner of which is described by Sir Robert Moray. Vid. Phil. Transf. N° 5.

Adit of a Mine is sometimes used for the air-shaft itself, being a hole driven perpendicularly from the surface of the earth into some part of a mine, to give entrance to the air. To draw off the standing water in winter, in deep mines, they drive up an adit, or air-shaft, upon which the air disengages itself from the water, when it begins to run with such violence as produces a noise equal to the bursting of a cannon, dashes every thing in the way against the sides of the mine, and loosens the very rocks at a distance. Ibid. N° 26.

ADJUDICATION, implies the act of adjudging, or determining, a cause in favour of some person.

ADJUDICATION, in Scots law, the name of that action by which a creditor attaches the heritable estate of his debtor, or his debtor's heir, in order to appropriate it to himself, either in payment or security of his debt; or that action by which the holder of an heritable right, labouring under any defect in point of form, may supply that defect.

ADJUNCT, among philosophers, signifies something added to another, without being any necessary part of it. Thus water absorbed by cloth or a sponge, is an adjunct, but no necessary part of either of these substances.

ADJUNCT, in metaphysics, some quality belonging to either the body or mind, whether natural or acquired. Thus thinking is an adjunct of the mind, and growth an adjunct of the body.

ADJUNCT, in music, a word which is employed to denominate the connection or relation between the principal mode and the modes of its two-fifths, which, from the intervals that constitute the relation between them and it, are called its *adjuncts*.

ADJUNCT is also used to signify a colleague, or some person associated with another as an assistant.

Adjunct Gods, or *Adjuncts of the Gods*, among the Romans, were a kind of inferior deities, added as assistants to the principal ones, to ease them in their functions. Thus, to Mars was adjoined Bellona and Nemesis; to Neptune, Salacia; to Vulcan, the Cabiri; to the Good Genius, the Lares; to the Evil, the Lemures, &c.

ADJUNCTS, in rhetoric and grammar, signify certain words or things added to others, to amplify or augment the force of the discourse.

ADJUNCTS, or ADJOINTS, in the royal academy of sciences at Paris, denote a class of members, attached to the pursuit of particular sciences. The class of *Adjuncts* was created in 1716, in lieu of the *Eleves*: they are twelve in number; two for geometry, two for mechanics, two for astronomy, two for anatomy, two for chemistry, and two for botany. The *Eleves* not taken into this establishment were admitted on the foot of supernumerary *Adjuncts*.

ADJUTANT, in the military art, is an officer whose business it is to assist the major. Each battalion of foot and regiment of horse has an adjutant, who receives the orders every night from the brigade-major; which, after carrying them to the colonel, he delivers out to the serjeants. When detachments are to be made, he gives the number to be furnished by each company or troop, and assigns the hour and place of rendezvous. He also places the guards; receives, and distributes the ammunition to the companies, &c.; and, by the major's orders, regulates the prices of bread, beer, and other provisions. The word is sometimes used by the French for an *aid-du-camp*.

Adjutants-general, among the jesuits, a select number of fathers, who resided with the general of the order, each of whom had a province or country assigned him, as England, Holland, &c. and their business was to inform the father-general of state-occurrences in such countries. To this end they had their correspondents delegated, emissaries, visitors, regents, provincials, &c.

ADJUTORIUM, a term used by physicians for any medicine in a prescription but the capital one.

ADLE-EGGS, such as have not received an impregnation from the semen of the cock.

ADLEGATION, in the public law of the German empire, a right claimed by the states of the empire of adjoin-

adjoining plenipotentiaries, in public treaties and negociations, to thofe of the emperor, for the tranfacting of matters which relate to the empire in general. In which fenfe *adlegation* differs from *legation*, which is the right of fending ambaffadors on a perfon's own account.—Several princes and ftates of the empire enjoy the right of *legation*, who have not that of *adlegation*, and *vice verfa*. The bifhops, for inftance, have the right of *adlegation* in the treaties which concern the common intereft, but no right of *legation* for their own private affairs. The like had the duke of Mantua.—The emperor allows the princes of Germany the privilege of *legation*, but difputes that of *adlegation*. They challenge it as belonging to them *jure regni*, which they enjoy in common with the emperor himfelf.

ADLOCUTION, Adlocutio, in antiquity, is chiefly underftood of fpeeches made by Roman generals to their armies, to encourage them before a battle. We frequently find thefe adlocutions expreffed on medals by the abbreviature Adlocut. Coh.—The general is fometimes reprefented as feated on a tribunal, often on a bank or mount of turf, with the cohorts ranged orderly round him, in *manipuli* and *turmæ*. The ufual formula in adlocutions was, *Fortis effet ac fidus*.

ADMANUENSES, in ancient law books, denote perfons who fwore by laying their hands on the book.—In which fenfe, *admanuenfes* amount to the fame with laymen; and ftand oppofed to clerks, who were forbid to fwear on the book, their word being to be reputed as their oath; whence they were alfo denominated *fide digni*.

ADMEASUREMENT, Admensuratio, in law, a writ which lies for the bringing thofe to reafon, or mediocrity, who ufurp more of any thing than their fhare. This writ lies in two cafes; termed,

Admeasurement of Dower, Admenfuratio dotis, where the widow of the deceafed holds more from the heir, or his guardian, on account of her dower, than of right belongs to her. And,

Admeasurement of Pafture, Admenfuratio pafturæ; this lies between thofe who have common of paftures appendant to their freehold, or common by vicinage, in cafe any of them furcharge the common with more cattle than they ought.

ADMINICLE, a term ufed chiefly in old lawbooks, to imply an aid, help, affiftance, or fupport. The word is Latin, *adminiculum;* and derived from *adminiculor*, to prop or fupport.

Adminicle, in Scots law, fignifies any writing or deed referred to by a party, in an action of law, for proving his allegations.

ADMINICULATOR, an ancient officer of the church, whofe bufinefs it was to attend to and defend the caufe of the widows, orphans, and others deftitute of help.

ADMINISTRATION, in general, the government, direction, or management of affairs, and particularly the exercife of diftributive juftice; among ecclefiaftics, it is often ufed to exprefs the giving or difpenfing the facraments, &c.

Administration, is alfo the name given by the Spaniards in Peru to the ftaple magazine, or warehoufe, eftablifhed at Callao, a fmall town on the S. Sea, which is the port of Lima, the capital of that part of South America, and particularly of Peru. The foreign fhips, which have leave to trade along that coaft, are obliged to unload here, paying 13 *per cent.* of the price they fell for, if the cargo be entire, and even 16 *per cent.* if otherwife; befides which, they pay 3 *per* 1000, duty, for confulfhip and fome other fmall royal rights and claims.

ADMINISTRATOR, in law, he to whom the ordinary commits the adminiftration of the goods of a perfon deceafed, in default of an executor.—An action lies for, or againft an adminiftrator, as for, or againft an executor; and he fhall be accountable to the value of the goods of the deceafed, and no farther:—unlefs there be wafte, or other abufe chargeable on him. If the adminiftrator die, his executors are not adminiftrators; but the court is to grant a new adminiftration.—If a ftranger, who is neither adminiftrator nor executor, take the goods of the deceafed, and adminifter, he fhall be charged, and fued as an executor, not as an adminiftrator. The origin of adminiftrators is derived from the civil law. Their eftablifhment in England is owing to a ftatute made in the 31ft year of Edw. III. Till then, no office of this kind was known befide that of executor: in cafe of a want of which, the ordinary had the difpofal of goods of perfons inteftate, &c.

Administrator, in Scots law, a perfon legally impowered to act for another whom the law prefumes incapable of acting for himfelf. Thus tutors or curators are fometimes ftyled *adminiftrators in law* to pupils, minors, or fatuous perfons. But more generally the term is ufed to imply that power which is conferred by the law upon a father over the perfons and eftates of his children during their minority. See Law, N°clxi.

Administrator, is fometimes ufed for the prefident of a province; for a perfon appointed to receive, manage, and diftribute, the revenues of an hofpital or religious houfe; for a prince who enjoys the revenues of a fecularized bifhopric; and for the regent of a kingdom during a minority of the prince, or a vacancy of the throne.

ADMIRABILIS sal, the fame with Glauber's falt. See Chemistry, n° 124.

ADMIRAL, a great officer or magiftrate, who has the government of a navy, and the hearing of all maritime caufes.

Authors are divided with regard to the origin and denomination of this important officer, whom we find eftablifhed in moft kingdoms that border on the fea. But the moft probable opinion is that of Sir Henry Spelman, who thinks, that both the name and dignity were derived from the Saracens, and, by reafon of the holy wars, brought amongft us; for *admiral*, in the Arabian language, fignifies a prince, or chief ruler, and was the ordinary title of the governors of cities, provinces, &c. and therefore they called the commander of the navy by that name, as a name of dignity and honour. And indeed there are no inftances of admirals in this part of Europe before the year 1284, when Philip of France, who had attended St Lewis in the wars againft the Saracens, created an admiral. Du Cange affures us, that the Sicilians were the firft, and the Genoefe the next, who gave the denomination of *Admiral* to the commanders of their naval armaments; and that they took it from the Saracen or Arabic *Emir*, a general name for every commanding officer. As for the exact time when the word was introduced among us, it is uncertain; fome think it was in the reign of

Edward I.

Admiral. Edward I. Sir Henry Spelman is of opinion that it was first used in the reign of Henry III. because neither the laws of Oleron made in 1266, nor Bracton, who wrote about that time, make any mention of it; and that the term *admiral* was not used in a charter in the eighth of Henry III. wherein he granted this office to Richard de Lacey, by these words *Maritim... m Angliæ;* but in the 56th year of the same reign, not only the historians, but the charters themselves, very frequently use the word *admiral.*

Anciently there were generally three or four admirals appointed in the English seas, all of them holding the office *durante bene placito;* and each of them having particular limits under their charge and government; as admirals of the fleet of ships, from the mouth of the Thames northward, southward, or westward. Besides these, there were admirals of the Cinque Ports, as in the reign of Edward III. when one William Latimer was styled *admiralis quinque portuum;* and we sometimes find that one person has been admiral of the fleets to the southward, northward, and westward: but the title of *admiralis Angliæ* was not frequent till the reign of Henry IV. when the king's brother had that title given him, which in all commissions afterwards was granted to the succeeding admirals. It may be observed, that there was a title above that of admiral of England, which was, *locum-tenens regis super mare*, the king's lieutenant-general of the sea; this title we find mentioned in the reign of Richard II.—Before the use of the word *admiral* was known, the title of *custos maris* was made use of.

Lord High ADMIRAL *of England*, in some ancient records called *capitanus maritimarum*, an officer of great antiquity and trust, as appears by the laws of Oleron, so denominated from the place they were made at by Richard I. The first title of *Admiral of England*, expressly conferred upon a subject, was given by patent of Richard II. to Richard Fitz-Allen, junr. earl of Arundel and Surrey; for those who before enjoyed this office were simply termed *admirals*, though their jurisdiction seems as large, especially in the reign of Edward III. when the court of admiralty was first erected.

This great officer has the management of all maritime affairs, and the government of the royal navy, with power of decision in all maritime cases both civil and criminal: he judges of all things done upon or beyond the sea, in any part of the world; upon the sea-coasts, in all ports and havens, and upon all rivers below the first bridge from the sea. By him, vice-admirals, rear-admirals, and all sea-captains, are commissioned; all deputies for particular coasts, and coroners to view dead bodies found on the sea-coasts, or at sea: he also appoints the judges for his court of admiralty, and may imprison, release, &c. All ports and havens are *infra corpus comitatus*, and the admiral hath no jurisdiction of any thing done in them. Between high and low water-mark, the common-law and the high-admiral have jurisdiction by turns, one upon the water, and the other upon the land.

The lord-admiral has power, not only over the seamen serving in his ships of war, but over all other seamen, to arrest them for the service of the state; and, if any of them run away, without leave of the admiral, he hath power to make a record thereof, and certify the same to the sheriffs, mayors, bailiffs, &c. who shall cause them to be apprehended and imprisoned.

To the lord high-admiral belong all penalties and amercements of all transgressions at sea, on the sea-shore, in ports and havens, and all rivers below the first bridge from the sea; the goods of pirates and felons condemned or enslaved; sea-wrecks, goods floating on the sea, or cast on the shore (not granted to lords of manors adjoining to the sea), and a share of lawful prizes; also all great fishes, commonly called *royal fishes*, except whales and sturgeons: to which add, a salary of 7000*l.* a-year. Admiral, Admiralty.

In short, this is so great an office, in point of trust, honour, and profit, that it has been usually given to princes of the blood, or the most eminent persons among the nobility. We have had no high admiral for some years; the office being put in commission, or under the administration of the lords commissioners of the admiralty, who by statute have the same power and authority as the lord high admiral.

Lord High ADMIRAL *of Scotland*, one of the great officers of the crown, and supreme judge in all maritime cases within that part of Britain. See LAW, Part III. N° clvii. 15.

ADMIRAL, also implies the commander in chief of any single fleet or squadron; or, in general, any flag-officer whatever. The commander of a fleet carries his flag at the main-top-mast head.

Vice ADMIRAL, is the commander of the second squadron, and carries his flag at the fore-top-mast head.

Rear ADMIRAL, is the commander of the third squadron, and carries his flag at the mizen-top-mast head.

Vice ADMIRAL, is also an officer appointed by the lords commissioners of the admiralty. There are several of these officers established in different parts of Great Britain, with judges and martials under them, for executing jurisdiction within their respective limits. Their decrees, however, are not final, an appeal lying to the court of admiralty in London.

ADMIRAL is also an appellation given to the most considerable ship of a fleet of merchant-men, or of the vessels employed in the cod-fishery of Newfoundland. This last has the privilege of choosing what place he pleases on the shore to dry his fish; gives proper orders, and appoints the fishing-places to those who come after him; and as long as the fishing-season continues, he carries a flag on his main-mast.

ADMIRAL, in zoology, the English name of a species of the voluta, a shell-fish belonging to the order of vermes testacea. See VOLUTA.

ADMIRALTY properly signifies the office of lord high-admiral, whether discharged by one single person, or by joint commissioners called *lords of the admiralty*.

Court of ADMIRALTY, is a sovereign court, held by the lord high-admiral, or lords of the admiralty, where cognizance is taken in all maritime affairs, whether civil or criminal.—All crimes committed on the high-seas, or on great rivers below the first bridge next the sea, are cognizable in this court only, and before which they must be tried by judge and jury. But in civil cases the mode is different, the decisions being all made according to the civil law. From the sentences of the admiralty-judge an appeal always lay, in ordinary course, to the king in chancery, as may be collected from statute 25 Hen. VIII. c. 19. which directs the appeal from the archbishop's courts to be determined by persons named in the king's commission, "like as in "case

"case of appeal from the admiral-court." But this is alfo exprefsly declared by ftatute 8 Eliz. c. 5. which enacts, that upon an appeal made to the chancery, the fentence definitive of the delegates appointed by commiffion fhall be final.

Appeals from the vice-admiralty courts in America, and our other plantations and fettlements, may be brought before the courts of admiralty in England, as being a branch of the admiral's jurifdiction, tho' they may alfo be brought before the king in council. But in cafe of prize-veffels, taken in time of war, in any part of the world, and condemned in any courts of admiralty or vice-admiralty as lawful prize, the appeal lies to certain *commiffioners of appeals* confifting chiefly of the privy council, and not to judges delegates. And this by virtue of divers treaties with foreign nations, by which particular courts are eftablifhed in all the maritime countries of Europe for the decifion of this queftion, Whether lawful prize or not? for this being a queftion between fubjects of different ftates, it belongs entirely to the law of nations, and not to the municipal laws of either country, to determine it.

Court of Admiralty in Scotland. See Law, Part III. N° clvii. 15.

Admiralty Iflands, lie in about 2° 18′ S. Lat. and 146° 44′ E. Long. There are between 20 and 30 iflands faid to be fcattered about here, one of which alone would make a large kingdom. Captain Carteret, who firft difcovered them, was prevented touching at them, although their appearance was very inviting, on account of the condition of his fhip, and of his being entirely unprovided with the articles of barter which fuit an Indian trade. He defcribes them as clothed with a beautiful verdure of woods, lofty and luxuriant, interfperfed with fpots that have been cleared for plantations, groves of cocoa nut-trees, and houfes of the natives, who feem to be very numerous. The largeft of thefe iflands is 18 leagues long in the direction of eaft and weft. The difcoverer thinks it highly probable that thefe iflands produce feveral valuable articles of trade, particularly fpices, as they lie in the fame climate and latitude as the Moluccas.

ADMONITION, in ecclefiaftical affairs, a part of difcipline much ufed in the ancient church. It was the firft act, or ftep, towards the punifhment or expulfion of delinquents. In cafe of private offences, it was performed according to the evangelical rule, privately: in cafe of public offence, openly, before the church. If either of thofe fufficed for the recovery of the fallen perfon, all further proceedings in the way of cenfure ceafed: if they did not, recourfe was had to excommunication.

Admonitio Fuftium, among the Romans, a military punifhment, not unlike our whipping, only it was performed with vine-branches.

ADMORTIZATION, in the feudal cuftoms, the reduction of the property of lands or tenements to mortmain. See Mortmain.

ADNATA, in anatomy, one of the coats of the eye, which is alfo called *conjunctiva* and *albuginea*.

Adnata, is alfo ufed for any hair, wool, or the like, which grows upon animals or vegetables.

Adnata, or *Adnafcentia*, among gardeners, denote thofe off-fets, which, by a new germination under the earth, proceed from the lily, narciffus, hyacinth, and

other flowers, and afterwards grow to true roots. The French call them *cayeux*, "ftalks."

ADNOUN, is ufed by fome grammarians to exprefs what we more ufually call an Adjective. The word is formed by way of analogy to adverb; in regard adjectives have much the fame office and relation to nouns that adverbs have to verbs. Bifhop Wilkins ufes the word *adname* in another fenfe, *viz.* for what we otherwife call a prepofition.

ADOLESCENCE, the ftate of growing youth; or that period of a perfon's age commencing from his infancy, and terminating at his full ftature or manhood. The word is formed of the Latin *adolefcere*, to grow.—The ftate of adolefcence lafts fo long as the fibres continue to grow, either in magnitude or firmnefs. The fibres being arrived at the degree of firmnefs and tenfion fufficient to fuftain the parts, no longer yield or give way to the efforts of the nutritious matter to extend them; fo that their farther accretion is ftopped, from the very law of their nutrition. Adolefcence is commonly computed to be between 15 and 25, or even 30 years of age; though in different conftitutions its terms are very different.—The Romans ufually reckoned it from 12 to 25 in boys; and to 21 in girls, &c. And yet, among their writers, *juvenis* and *adolefcens* are frequently ufed indifferently for any perfon under 45 years.

ADOLLAM, or Odollam (anc. geog.), a town in the tribe of Judah, to the eaft of Eleutheropolis. David is faid to have hid himfelf in a cave near this town, (Bible.)

ADON, a populous village in the province of Stuhl-Weiffemberg, belonging to Hungary. It lies in a fruitful country, towards the river Danube. Long. 19. 20. Lat. 47. 30.

ADONAI, one of the names of the Supreme Being in the fcriptures. The proper meaning of the word is *my lords*, in the plural number; as *Adoni* is *my lord*, in the fingular. The Jews, who either out of refpect, or fuperftition, do not pronounce the name of *Jehovah*, read *Adonai* in the room of it, as often as they meet with Jehovah in the Hebrew text. But the ancient Jews were not fo fcrupulous; nor is there any law which forbids them to pronounce the name of God. Calmet.

ADONIA, in antiquity, folemn feafts in honour of Venus, and in memory of her beloved Adonis. The Adonia were obferved with great folemnity by moft nations; Greeks, Phœnicians, Lycians, Syrians, Egyptians, &c. From Syria, they are fuppofed to have paffed into India. The prophet Ezekiel* is underftood to fpeak of them. They were ftill obferved at Alexandria in the time of St Cyril; and at Antioch in that of Julian the apoftate, who happened to enter that city during the folemnity, which was taken for an ill omen. The Adonia lafted two days: on the firft of which certain images of Venus and Adonis were carried, with all the pomp and ceremonies practifed at funerals; the women wept, tore their hair, beat their breafts, &c. imitating the cries and lamentations of Venus for the death of her paramour. This lamentation they called Ἀδωνιασμός. The Syrians were not contented with weeping, but gave themfelves difcipline, fhaved their heads, &c. Among the Egyptians, the queen herfelf ufed to carry the image of Adonis in proceffion. St Cyril mentions an extraordinary ceremony practifed by the Alexandrians: A letter was written to the women of Bybulus, to inform them that

* Ch. viii. 14.

Adonis,

Adonis was found again: this letter was thrown into the sea, which (it was pretended) did not fail punctually to convey it to Bybulus in seven days; upon the receipt of which, the Byblian women ceased their mourning, sung his praises, and made rejoicings as if he were raised to life again: Or rather, according to Meursius, the two offices of mourning and rejoicing made two distinct feasts, which were held at different times of the year, the one six months after the other; Adonis being supposed to pass half the year with Proserpine, and half with Venus.—The Egyptian Adonia are said to have been held in memory of the death of Osiris; by others, of his sickness and recovery. Bishop Patrick dates their origin from the slaughter of the first-born under Moses.

ADONIDES, in botany, a name given to botanists who described or made catalogues of plants cultivated in any particular place.

ADONIS, son to Cinyras king of Cyprus, the darling of the goddess Venus: being killed by a wild boar in the Idalian woods, he was turned into a flower of a blood-colour, supposed to be the Anemone. Venus was inconsolable; and no grief was ever more celebrated than this, most nations having perpetuated the memory of it by a train of anniversary ceremonies *. Among Shakespeare's poems, is a long one on the subject of Venus's affection for Adonis.

* See *Adonia*

The text of the vulgate in Ezekiel, viii. 14. says, that this prophet saw women sitting in the temple, and weeping for Adonis: but according to the reading of the Hebrew text, they are said to weep for Tammuz, or the *hidden one*. Among the Egyptians, Adonis was adored under the name of Osiris the husband of Isis. But he was sometimes called by the name of Ammuz, or Tammuz, *the concealed*, to denote probably his death or burial. The Hebrews, in derision, call him sometimes the *dead*, Psal. cvi. 28. and Lev. xix. 28. because they wept for him, and represented him as one dead in his coffin; and at other times, they call him the image of jealousy, Ezek. viii. 3. 5. because he was the object of the god Mars's jealousy. The Syrians, Phœnicians, and Cyprians called him Adonis, and F. Calmet is of opinion, that the Ammonites and Moabites gave him the name of Baal-peor. See BAAL-PEOR.

ADONIS, *Adonius*, (anc. geog.); a river of Phœnicia, rising in mount Lebanon, and falling into the sea, after a north-west course, at Bybulus; famous in fable, as a beautiful shepherd youth, Virgil; son of Cynaras, king of the Cyprians, loved by Venus, slain by a boar, and turned into a river. Theocritus laments him dead in an idyllion, or rather ode, as did the women yearly, when in flood-time, the river rolled down a red earth, which tinged its waters, deemed to be his wound bleeding afresh In the Phœnician language Adan signifies a willow, and Adon lord, with the same radical letters. Hence Ιταιος Αδωνις, Salignus, and Κυρις, or Κιρις Αδωνις, for Κυριος. Adonidis horti, are gardens beautifully arranged, but more adapted for pleasure than profit.

ADONIS, *Birds-eye*, or *Pheasants-eye;* a genus of the polyandria order, belonging to the polygynia class of plants. It is associated with the *Multisiliquæ*, or 26th Nat. Order.—The characters are: The *calyx* is a perianthium, consisting of five obtuse concave leaves, somewhat coloured, and deciduous. The *corolla* has from five to fifteen oblong petals obtuse and glossy. The *stamina* consist of very numerous, short, subulated filaments; the antheræ are oblong and inflected. The *pistillum* has numerous germina collected in a head; no styli; the stigmata acute and reflected. There is no *pericarpium;* the receptacle is oblong and spiked. The *seeds* are numerous, irregular, angular, gibbous at the base, reflected at the top, somewhat prominent, and awnless.

Species. The most remarkable species are the following: 1. The annua, or common adonis, is a native of Kent, where it is found in great plenty in the fields sown with wheat. Its flowers are of a beautiful scarlet colour, and appear in the beginning of June; the seeds ripening in August and September. Great quantities of these flowers are sold in London, under the name of Red Morocco. 2. The æstivalis, or annual adonis, with yellow flowers, grows much taller than the first, has its leaves thinner set, and of a lighter colour. 3. The vernalis, or perennial adonis, grows naturally on the mountains of Bohemia, Prussia, and other parts of Germany. It flowers the latter end of March, or beginning of April; the stalks rise about a foot and a half high; and when the roots are large, and have stood unremoved for some years, they will put out a great number of stalks from each root; on the top of each of these grows one large yellow flower. 4. The apennina, is a native of Siberia and the Appenines.

Culture. The first two species, being annual, must be propagated from seeds, which ought to be sown in autumn, soon after they are ripe, or they will be in danger of not growing up that year. They thrive best in a light soil. The third and fourth species are likewise to be propagated from seeds, which must be sown in autumn, or they seldom succeed. When the plants come up, they must be carefully kept clear from weeds; and in very dry weather their growth will be promoted by being now and then watered. They should remain in the place where they are sown till the second year; and be transplanted thence in autumn, to the place where they are to remain.

ADONISTS, a sect or party, among Divines and Critics, who maintain, that the Hebrew points ordinarily annexed to the consonants of the word Jehovah, are not the natural points belonging to that word, nor express the true pronunciation of it; but are the vowel-points, belonging to the words *Adonai* and *Elohim*, applied to the consonants of the ineffable name Jehovah; to warn the readers, that instead of the word Jehovah, which the Jews were forbid to pronounce, and the true pronunciation of which had been long unknown to them, they are always to read *Adonai*. They are opposed to *Jehovists:* of whom the principal are Drusius, Capellus, Buxtorf, Alting, and Reland, who has published a collection of their writings on this subject.

ADOPTIANI, in church-history, a sect of ancient heretics, followers of Felix of Urgel, and Elipand of Toledo, who, towards the end of the eighth century, advanced the notion, that Jesus Christ, in his human nature, is the son of God, not by nature, but by adoption.

ADOPTION, an act by which any one takes another into his family, owns him for his son, and appoints him for his heir.

The custom of adoption was very common among the ancient Greeks and Romans; yet it was not prac-

Adoption. tised, but for certain causes expressed in the laws, and with certain formalities usual in such cases. It was a sort of imitation of nature, intended for the comfort of those who had no children: wherefore he that was to adopt was to have no children of his own, and to be past the age of getting any; nor were eunuchs allowed to adopt, as being under an actual impotency of begetting children; neither was it lawful for a young man to adopt an elder, because that it would have been contrary to the order of nature; nay, it was even required that the person who adopted should be eighteen years older than his adopted son, that there might at least appear a probability of his being the natural father.

Among the Greeks it was called υιοτης, *filiation.* It was allowed to such as had no issue of their own; excepting those who were not κυριοι εαυτων, *their own masters*, e. g. slaves, women, madmen, infants, or persons under twenty years of age; who being incapable of making wills, or managing their own estates, were not allowed to adopt heirs to them. Foreigners being incapable of inheriting at Athens, if any such were adopted, it was necessary first to make them free of the city. The ceremony of adoption being over, the adopted had his name inrolled in the tribe and ward of his new father; for which entry a peculiar time was allotted, viz. the festival θαργηλια. To prevent rash and inconsiderate adoptions, the Lacedæmonians had a law, that adoptions should be transacted, or at least confirmed, in the presence of their kings. The children adopted were invested with all the privileges, and obliged to perform all the duties, of natural children; and being thus provided for in another family, ceased to have any claim of inheritance, or kindred, in the family which they had left, unless they first renounced their adoption; which, by the laws of Solon, they were not allowed to do, unless they had first begotten children, to bear the name of the person who had adopted them: thus providing against the ruin of families, which would otherwise have been extinguished by the desertion of those who had been adopted to preserve them. If the children adopted happened to die without children, the inheritance could not be alienated from the family into which they had been adopted, but returned to the relations of the adopter. It should seem, that by the Athenian law, a person, after having adopted another, was not allowed to marry without permission from the magistrate: in effect, there are instances of persons, who being ill used by their adoptive children, petitioned for such leave. However this be, it is certain some men married after they had adopted sons: in which case, if they begat legitimate children, their estates were equally shared between the begotten and adopted.

The Romans had two forms of adoption; one before the pretor; the other at an assembly of the people, in the times of the commonwealth, and afterwards by a rescript of the emperor. In the former, the natural father addressed himself to the pretor, declaring that he emancipated his son, resigned all his authority over him, and consented he should be translated into the family of the adopter. The latter was practised, where the party to be adopted was already free; and this was called *adrogation.* The person adopted changed all his names; assuming the prename, name, and surname, of the person who adopted him.

Besides the formalities prescribed by the Roman law, Adoption. various other methods have taken place; which have given denominations to different species of adoption, among the Gothic nations, in different ages. As,

Adoption *by arms*, was when a prince made a present of arms to a person, in consideration of his merit and valour. Thus it was that the king of the Heruli was adopted by Theodoric; Athalaric by the emperor Justinian; and Cosroes, nephew of the king of Persia, by the emperor Justin.—The obligation here laid on the adoptive son was, to protect and defend the father from injuries, affronts, &c. And hence, according to Selden, the ceremony of dubbing knights took its origin as well as name.

Adoption *by baptism*, is that spiritual affinity which is contracted by god-fathers and god-children in the ceremony of baptism. This kind of adoption was introduced into the Greek church, and came afterwards into use among the ancient Franks, as appears by the Capitulars of Charlemagne.

In reality, the god-father was so far considered as adoptive father, that his god-children were supposed to be intitled to a share in the inheritance of his estate.

Adoption *by hair*, was performed by cutting off the hair of a person, and giving it to the adoptive father. It was thus that pope John VIII. adopted Boson king of Arles; which, perhaps, is the only instance in history, of adoption, in the order of the ecclesiastics; a law that professes to imitate nature, not daring to give children to those in whom it would be thought a crime to beget any.

Adoption *by matrimony*, is the taking the children of a wife or husband, by a former marriage, into the condition of proper or natural children; and admitting them to inherit on the same footing with those of the present marriage. This is a practice peculiar to the Germans; among whom, it is more particularly known by the name of *einkindschaft;* among their writers in Latin, by that of *unio prolium*, or *union of issues.* But the more accurate writers observe, that this is no adoption. See Adfiliation.

Adoption *by testament*, that performed by appointing a person heir by will, on condition of his assuming the name, arms, &c. of the adopter. Of which kind we meet with several instances in the Roman history.

Among the Turks, the ceremony of adoption is performed by obliging the person adopted to pass through the shirt of the adopter. Hence, among that people, to adopt, is expressed by the phrase, *to draw another through my shirt.* It is said, that something like this has also been observed among the Hebrews; where the prophet Elijah adopted Elisha for his son and successor, and communicated to him the gift of prophecy, by letting fall his cloak or mantle on him. But adoption, properly so called, does not appear to have been practised among the ancient Jews: Moses says nothing of it in his laws; and Jacob's adoption of his two grandsons, Ephraim and Manasseh, is not so properly an adoption, as a kind of substitution, whereby those two sons of Joseph were allotted an equal portion in Israel with his own sons.

Adoption is also used, in theology, for a federal act of God's free grace; whereby those who are regenerated by faith, are admitted into his household, and intitled

intitled to a ſhare in the inheritance of the kingdom of heaven.

Adoption is ſometimes alſo uſed, in ſpeaking of the ancient clergy, who had a cuſtom of taking a maid or widow into their houſes, under the denomination of an *adoptive*, or *ſpiritual ſiſter* or *niece*.

Adoption is alſo uſed in ſpeaking of the admiſſion of perſons into certain hoſpitals, particularly that of Lyons; the adminiſtrators whereof have all the power and rights of parents over the children admitted.

Adoption is alſo uſed for the reception of a new academy into the body of an old one.—Thus

The French academy of Marſeilles was adopted by that of Paris; on which account, we find a volume of ſpeeches extant, made by ſeveral members of the academy of Marſeilles, deputed to return thanks to that of Paris for the honour.

In a ſimilar ſenſe, adoption is alſo applied by the Greeks, to the admitting a monk, or brother, into a monaſtic community; ſometimes called *ſpiritual adoption*.

ADOPTIVE, denotes a perſon or thing adopted by another.

Adoptive children, among the Romans, were on the ſame footing with natural ones; and accordingly were either to be inſtituted heirs, or expreſsly diſinherited, otherwiſe the teſtament was null. The emperor Adrian preferred adoptive children to natural ones; becauſe we chooſe the former, but are obliged to take the latter at random.

M. Menage has publiſhed a book of eloges, or verſes addreſſed to him; which he calls *Liber Adoptivus*, an adoptive book; and adds it to his other works.—Heinſius, and Furſtemburg of Munſter, have likewiſe publiſhed adoptive books.

In eccleſiaſtical writers we find adoptive women, or ſiſters, (*adoptivæ fœminæ*, or *ſorores*,) uſed for thoſe handmaids of the ancient clergy, otherwiſe called *ſubintroductæ*.

Adoptive arms are thoſe which a perſon enjoys by the gift or conceſſion of another, and to which he was not otherwiſe intitled. They ſtand contradiſtinguiſhed from arms of alliance.

We ſometimes meet with adoptive hair, by way of oppoſition to natural hair; and adoptive gods, by way of contradiſtinction to domeſtic ones. The Romans, notwithſtanding the number of their domeſtic, had their adoptive gods, taken chiefly from the Egyptians: ſuch were Iſis, Oſiris, Anubis, Apis, Harpocrates, and Canopus.

ADORATION, the act of rendering divine honours; or of addreſſing a being, as ſuppoſing it a god. The word is compounded of *ad*, "to;" and *os*, *oris*, "mouth;" and literally ſignifies, to apply the hand to the mouth; *Manum ad os admovere, q. d.* "to kiſs the hand;" this being, in the eaſtern countries, one of the great marks of reſpect and ſubmiſſion.—The Romans practiſed adoration at ſacrifices, and other ſolemnities; in paſſing by temples, altars, groves, &c.; at the ſight of ſtatues, images, or the like, whether of ſtone or wood, wherein any thing of divinity was ſuppoſed to reſide. Uſually there were images of the gods placed at the gates of cities, for thoſe who went in or out, to pay their reſpects to.—The ceremony of adoration among the ancient Romans was thus: The devotee having his head *covered*, applied his right hand to his lips, the fore-finger reſting on his thumb, which was erect, and thus bowing his head, turned himſelf round from left to right. The kiſs thus given was called *oſculum labratum;* for ordinarily they were afraid to touch the images of their gods themſelves with their profane lips. Sometimes, however, they would kiſs their feet, or even knees, it being held an incivility to touch their mouths; ſo that the affair paſſed at ſome diſtance. Saturn, however, and Hercules, were adored with the head *bare;* whence the worſhip of the laſt was called *inſtitutum peregrinum*, and *ritus Græcanicus*, as departing from the cuſtomary Roman method, which was to ſacrifice and adore with the face veiled, and the cloths drawn up to the ears, to prevent any interruption in the ceremony by the ſight of unlucky objects.—The Jewiſh manner of adoration was by proſtration, bowing, and kneeling.—The Chriſtians adopted the Grecian rather than the Roman method, and adored always *uncovered*. The ordinary poſture of the ancient Chriſtians was kneeling, but on Sundays ſtanding: and they had a peculiar regard to the Eaſt, to which point they ordinarily directed their prayers.

Adoration is more particularly uſed for the act of praying, or preferring our requeſts or thankſgivings to Almighty God.

Adoration is alſo uſed for certain extraordinary civil honours or reſpects which reſemble thoſe paid to the Deity, yet are given to men.

The Perſian manner of *Adoration*, introduced by Cyrus, was by bending the knee, and falling on the face at the prince's feet, ſtriking the earth with the forehead, and kiſſing the ground. This ceremony, which the Greeks called προσκυνειν, Conon refuſed to perform to Artaxerxes, and Caliſthenes to Alexander the Great, as reputing it impious and unlawful.

The *Adoration* performed to the Roman and Grecian emperors conſiſted in bowing or kneeling at the prince's feet, laying hold of his purple robe, and preſently withdrawing the hand and clapping it to the lips. Some attribute the origin of this practice to Conſtantius. It was only perſons of ſome rank or dignity that were intitled to the honour. Bare kneeling before the emperor to deliver a petition, was alſo called *adoration*.

The practice of *adoration* may be ſaid to be ſtill ſubſiſting in England, in the ceremony of kiſſing the king's or queen's hand, and in ſerving them at table, both being performed kneeling.

Adoration is more particularly uſed for kiſſing one's hand in preſence of another, as a token of reverence.—The Jews adored by kiſſing their hands and bowing down their heads; whence, in their language, *kiſſing* is properly uſed for *adoration*.

Adoration is alſo uſed among Roman writers for a high ſpecies of applauſe given to perſons, who had ſpoken or performed well in public. (See Acclamation.) We meet with adoration paid to orators, actors, muſicians, &c. The method of expreſſing it was, by riſing, putting both hands to their mouth, and then returning them towards the perſon intended to be honoured.

Adoration is alſo uſed, in the court of Rome, for the ceremony of kiſſing the pope's feet.—The introduction of adoration among the Romans is aſcribed to the low flattery of Vitellius, who, upon the return of C. Cæſar from Syria, would not approach him otherwiſe than

than with his head covered, turning himſelf round, and then falling on his face. Heliogabulus reſtored the practice, and Alexander Severus again prohibited it. Diocleſian redemanded it; and it was, in ſome meaſure, continued under the ſucceeding princes, even after the eſtabliſhment of Chriſtianity, as Conſtantine, Conſtantius, &c. It is particularly ſaid of Diocleſian, that he had gems faſtened to his ſhoes, that divine honours might be more willingly paid him, by kiſſing his feet. The like uſage was afterwards adopted by the popes, and is obſerved to this day. Theſe prelates, finding a vehement diſpoſition in the people to fall down before them and kiſs their feet, procured crucifixes to be faſtened on their ſlippers; by which ſtratagem, the adoration intended for the pope's perſon is ſuppoſed to be transferred to Chriſt. Divers acts of this adoration we find offered even by princes to the pope.

Adoration is alſo uſed for a method of electing a pope. The election of popes is performed two ways; by *adoration*, and by *ſcrutiny*. In election by adoration, the cardinals ruſh haſtily, as if agitated by ſome ſpirit, to the adoration of ſome one among them, to proclaim him pope. When the election is carried by ſcrutiny, they do not adore the new pope till he is placed on the altar.

Barbarous Adoration is a term uſed, in the laws of king Canute, for that performed after the manner of the heathens who adored idols. The Romiſh church is charged with the adoration of ſaints, martyrs, images, crucifixes, relics, the virgin, and the hoſt; all which by Proteſtants are generally aggravated into idolatry, on a ſuppoſition, that the honour thus paid to them is abſolute and ſupreme, called by way of diſtinction *Latria*, which is due only to God. Roman-catholics, on the contrary, explain them, as only a relative or ſubordinate worſhip, called *Dulia* and *Hyperdulia*, which terminates ultimately in God alone. But may not the ſame be ſaid of the idol-worſhip of the heathens? The Phœnicians adored the winds, on account of the terrible effects produced by them; the ſame was adopted by moſt of the other nations, Perſians, Greeks, Romans, &c. The Perſians chiefly paid their adorations to the ſun and fire; ſome ſay alſo to rivers, the wind, &c. The motive of adoring the ſun was the benefits they received from that glorious luminary, which of all creatures has doubtleſs the beſt pretenſions to ſuch homage.

ADOREA, in Roman antiquity, a word uſed in different ſenſes; ſometimes for all manner of grain, ſometimes for a kind of cakes made of fine flour, and offered in ſacrifice; and finally for a dole or diſtribution of corn, as a reward for ſome ſervice; whence by metonymy it is put for praiſe or rewards in general.

ADOSCULATION, a term uſed by Dr Grew, to imply a kind of impregnation, without intromiſſion; and in this manner he ſuppoſes the impregnation of plants is effected by the falling of the farina fœcundans on the piſtil.

ADOSEE, in heraldry, ſignifies two figures or bearings being placed back to back.

ADOUR, the name of a river of France, which riſes in the mountains of Bigorre, and running N. by Tarbes through Gaſcony, afterwards turns E. and, paſſing by Dax, falls into the bay of Biſcay, below Bayonne.

ADOXA, Tuberous Moschatel, Hollow-root, or Inglorious; a genus of the tetragynia order, belonging to the octandria claſs of plants. In the natural method it belongs to the 13th order, or *Succulentæ.*—The characters of this genus are: The *calyx* is a perianthium beneath, divided into two ſegments, flat, perſiſtent. The *corolla* is compoſed of one flat petal, divided into four ovate acute ſegments longer than the calyx. The *ſtamina* conſiſt of eight ſubulated filaments the length of the calyx; with roundiſh antheræ. The *piſtillum* has a germen beneath the receptacle of the corolla; four ſimple, erect, perſiſtent ſtyli, the length of the ſtamina; and ſimple ſtigmata. The *pericarpium* is a globular four-celled berry between the calyx and corolla. The *ſeeds* are ſolitary and compreſſed.

There is but one ſpecies, which is a native of the woods in Britain, and ſeveral parts of Europe: it is a very low plant, ſeldom riſing more than four or five inches high; the leaves reſemble thoſe of bulbous fumitory; the flower-ſtalk ariſes immediately from the root, on the top of which grow four or five ſmall flowers of an herbaceous white colour, which appear in the beginning of April, and the berries ripen in May; ſoon after which, the leaves decay. The herb may be procured by tranſplanting the roots any time after the leaves decay, till winter. They muſt be planted in the ſhade, under ſhrubs; for they will not thrive if expoſed to the ſun. The leaves and flowers ſmell like muſk, from whence it has by ſome been called *muſk-crowfoot*.

AD pondus omnium, among phyſicians, an abbreviation in their preſcriptions, ſignifying that the laſt mentioned ingredient is to weigh as much as all the reſt together.

Ad Quod Damnum, in the Engliſh law, a writ directed to the ſheriff, commanding him to inquire into the damage which may befal from granting certain privileges to a place, as a fair, a market, or the like.

ADRACHNE, in botany, a ſpecies of the ſtrawberry-tree. See Arbutus.

ADRAMMELECH, one of the gods of the inhabitants of Sepharvaim, who were ſettled in the country of Samaria, in the room of thoſe Iſraelites who were carried beyond the Euphrates. The Sepharvaites made their children paſs through the fire, in honour of this idol and another called *Anamelech*. It is ſuppoſed, that Adrammelech meant the ſun, and Anamelech the moon: the firſt ſignifies *the magnificent king;* the ſecond *the gentle king*.

ADRAMYTTIUM (anc. geog.), now *Andramiti;* a town of Myſia Major, at the foot of mount Ida, an Athenian colony, with a harbour and dock near the Caicus. *Adramyttenus* the epithet; as, *Adramyttenus Sinus*, a part of the Egean Sea, on the coaſt of Myſia; *Adramyttenus Convenus*, ſeſſions or aſſizes. The eighth in order of the nine *Conventus Juridici* of the province of Aſia.

ADRANA, a river of Germany, (Polybius); now the Eder, riſing on the borders of the county of Naſſau, to the north-eaſt of, and not far from Dillenburg, running through the landgraviate of Heſſe, the county of Waldeck, by Fritzlar, and then again through the landgraviate, and, together with the Fulda, falling into the Weſer, to the ſouth of, and not far from Caſſel.

ADRANUM, or Hadranum, (anc. geog.), now *Aderno;* a town of Sicily, built by the elder Dionyſius, at

at the foot of mount Ætna, (Diodorus Siculus), four hundred years before Christ. So called from the temple of Adranus, or Hadranus, a god much worshipped by the Sicilians; with a river of the same name, (Stephanus,) now *Fiume d'Aderno*. The inhabitants, *Hadranitani*, and *Adranitæ*.

ADRASTEA, in antiquity, an epithet given to the goddess Nemesis, or Revenge. It was taken from king Adrastus, who first erected a temple to that deity.

Adrastia *Certamina*, in antiquity, a kind of Pythian games, instituted by Adrastus king of Argos, in the year of the world 2700, in honour of Apollo, at Sicyon. These are to be distinguished from the Pythian games celebrated at Delphi.

ADRASTUS, king of Argos, son of Talaus and Lysianissa, daughter of Polybius king of Sicyon, acquired great honour in the famous war of Thebes, in support of Polynices his son-in-law, who had been excluded the sovereignty of Thebes by Eteocles his brother, notwithstanding their reciprocal agreement. Adrastus, followed by Polynices and Tydeus his other son-in-law, by Capaneus and Hippomedon his sister's sons, by Amphiaraus his brother-in-law, and by Parthenopæus, marched against the city of Thebes; and this is the expedition of the Seven Worthies, which the poets have so often sung. They all lost their lives in this war, except Adrastus, who was saved by his horse called Arion. This war was revived ten years after by the sons of those deceased warriors, which was called the war of the Epigones, and ended with the taking of Thebes. None of them lost their lives except Ægialeus son of Adrastus; which afflicted him so much that he died of grief in Megara, as he was leading back his victorious army.

ADRAZZO, or Ajaccio. The same with Adjazzo.

ADRIA, or Hadria (anc. geog.), the name of two towns in Italy. One in the country of the Veneti, on the river Tartarus, between the Padus and the Athesis, called *Atria* by Pliny and Ptolemy, but *Adrias* by Strabo. Another on the river Vomanus, in the territory of the Piceni, (to which Antonine's Itinerary from Rome is directed), the country of the ancestors of the emperor Adrian. From which of these the Adriatic sea is denominated, is matter of doubt. A third opinion is, that it is so called from Adrias the son of Joan, of Italian origin; (Eustathius in Dionysium.)

ADRIANUM (or Adriaticum) mare (anc. geog.), now the gulf of Venice, a large bay in the Mediterranean, between Dalmatia, Sclavonia, Greece, and Italy. It is called by the Greeks, Αδριας Κολπος; and *Adria* by the Romans, (as *Arbiter Adriæ Notus*, Hor.) Cicero calls it *Hadrianum Mare;* Virgil has *Hadriaticas Undas*. It is commonly called *Mare Adriaticum*, without an aspiration; but whether it ought to have one, is a dispute: if the appellation is from *Hadria*, the town of the Piceni, it must be written *Hadriaticum*, because the emperor's name, who thence derives his origin, is on coins and stones *Hadrianus;* but if from the town in the territory of Venice, as the more ancient, and of which that of the Piceni is a colony, this will justify the common appellation *Adriaticum*.

ADRIAN, or Hadrian, (Publius Ælius), the Roman emperor. He was born at Rome the 24[th] of January, in the 76[th] year of Christ. His father left him an orphan, at ten years of age, under the guardianship of Trajan, and Cœlius Tatianus a Roman knight. He began to serve very early in the armies, having been tribune of a legion before the death of Domitian. He was the person chosen by the army of Lower Mœsia, to carry the news of Nerva's death to Trajan, successor to the empire. He accompanied Trajan in most of his expeditions, and particularly distinguished himself in the second war against the Daci; and having before been quæstor, as well as tribune of the people, he was now successively prætor, governor of Pannonia, and consul. After the siege of Atra in Arabia was raised, Trajan, who had already given him the government of Syria, left him the command of the army: and at length, when he found death approaching, it is said he adopted him. Adrian, who was then in Antiochia, as soon as he received the news thereof, and of Trajan's death, declared himself emperor, on the 11[th] of August, 117. No sooner had he arrived at the imperial dignity, than he made peace with the Persians, to whom he yielded up great part of the conquests of his predecessors; and from generosity, or policy, he remitted the debts of the Roman people, which, according to the calculation of those who have reduced them to modern money, amounted to 22,500,000 golden crowns; and he burnt all the bonds and obligations relating to those debts, that the people might be under no apprehension of being called to an account for them afterwards. There are medals in commemoration of this fact, in which he is represented holding a flambeau in his hand, to set fire to all those bonds which he had made void. He went to visit all the provinces; and did not return to Rome till the year 118, when the senate decreed him a triumph, and honoured him with the title of Father of his country; but he refused both, and desired that Trajan's image might triumph. No prince travelled more than Adrian; there being hardly one province in the empire which he did not visit. In 120 he went into Gaul; from thence he went over to Britain, in order to subdue the Caledonians, who were making continual inroads into the provinces. Upon his arrival they retired towards the north: he advanced however as far as York, where he was diverted from his intended conquest by the description some old soldiers he found there, who had served under Agricola, gave him of the country. In hopes, therefore, of keeping them quiet by enlarging their bounds, he delivered up to the Caledonians all the lands lying between the two Friths and the Tyne; and at the same time, to secure the Roman province from their future incursions, built the famous wall which still bears his name (A). Having thus settled

(A) This work, though called by the Roman historians *murus*, which signifies a wall of stone, was only composed of earth covered with green turf. It was carried on from the Solway Frith, a little west of the village of Burgh on the Sands, in as direct a line as possible, to the river Tyne on the east, at the place where the

Adrian.

tled matters in Britain, he returned to Rome, where he was honoured with the title of Reſtorer of Britain, as appears by ſome medals. He ſoon after went into Spain, to Mauritania, and at length into the Eaſt, where he quieted the commotions raiſed by the Parthians. After having viſited all the provinces of Aſia, he returned to Athens in 125, where he paſſed the winter, and was initiated in the myſteries of Eleuſinian Ceres. He went from thence to Sicily, chiefly to view mount Ætna, contemplate its phenomena, and enjoy the beautiful and extenſive proſpect afforded from its top. He returned to Rome the beginning of the year 129; and, according to ſome, he went again, the ſame year, to Africa; and, after his return from thence, to the Eaſt. He was in Egypt in the year 132, reviſited Syria the year following, returned to Athens in 134, and to Rome in 135. The perſecution againſt the Chriſtians was very violent under his reign; but it was at length ſuſpended, in conſequence of the remonſtranees of Quadrat biſhop of Athens, and Ariſtides, two Chriſtian philoſophers, who preſented the emperor with ſome books in favour of the Chriſtian religion. He conquered the Jews; and, by way of inſult, erected a temple to Jupiter on Calvary, and placed a ſtatue of Adonis in the manger of Bethlehem; he cauſed alſo the images of ſwine to be engraven on the gates of Jeruſalem. At laſt he was ſeized with a dropſy, which vexed him to ſuch a degree, that he became almoſt raving mad. A great number of phyſicians were ſent for, and to the multitude of them he aſcribed his death. He died at Baiæ in the 63^{d} year of his age, having reigned 21 years. The Latin verſes (B) he addreſſed to his ſoul have been much criticiſed and variouſly interpreted. There are ſome fragments of his Latin poems extant, and there are Greek verſes of his in the Anthology. He alſo wrote the hiſtory of his own life: to which, however, he did not chuſe to put his name; but that of Phlegon, one of his freed-men, a very learned perſon, was prefixed to it*. He had great wit, and an extenſive memory. He underſtood the ſciences perfectly well; but was very jealous of others who excelled in them. He was alſo cruel, envious, and laſcivious. Antoninus his ſucceſſor obtained his apotheoſis; and prevented the reſciſſion of his acts, which the ſenate once intended.

*Vide Spartian, in Adriano.

Adrian.

ADRIAN IV. (Pope), the only Engliſhman who ever had the honour of ſitting in the papal chair. His name was Nicholas Brekeſpere; and he was born at Langley, near St Alban's, in Hertfordſhire. His father having left his family, and taken the habit of the monaſtery of St Alban's, Nicholas was obliged to ſubmit to the loweſt offices in that houſe for daily ſupport. After ſome time, he deſired to take the habit in that monaſtery, but was rejected by the abbot Richard. Upon this he reſolved to try his fortune in another country, and accordingly went to Paris; where, though in very poor circumſtances, he applied himſelf to his ſtudies with great aſſiduity, and made a wonderful proficiency. But having ſtill a ſtrong inclination to a religious life, he left Paris, and removed to Provence, where he became a regular clerk in the monaſtery of St Rufus. He was not immediately allowed to take the habit; but paſſed ſome time, by way of trial, in recommending himſelf to the monks by a ſtrict attention to all their commands. This behaviour, together with the beauty of his perſon, and prudent converſation, rendered him ſo acceptable to thoſe religious, that after ſome time they intreated him to take the habit of the canonical order. Here he diſtinguiſhed himſelf ſo much by his learning and ſtrict obſervance of the monaſtic diſcipline, that, upon the death of the abbot, he was choſen ſuperior of that houſe; and we are told that he rebuilt that convent. Pope Eugenius III. being appriſed of the great merit of Nicholas, and thinking he might be ſerviceable to the church in a higher ſtation, created him cardinal-biſhop of Alba in 1146. In 1148, his Holineſs ſent him legate to Denmark and Norway; where, by his fervent preaching and diligent inſtructions, he converted thoſe barbarous nations to the Chriſtian faith; and erected Upſal

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the town of Newcaſtle now ſtands; ſo that it muſt have been above 60 Engliſh, and near 70 Roman miles in length. It conſiſted of four parts: 1. The principal *agger*, mound of earth, or rampart, on the brink of the ditch. 2. The ditch on the north ſide of the rampart. 3. Another rampart on the ſouth ſide of the principal one, about five paces diſtant from it. 4. A large rampart on the north ſide of the ditch.—This laſt was probably the military way to the line of forts on this work: it was ſo to thoſe formerly built by Agricola; and if it did not ſerve the ſame purpoſe in this, there muſt have been no military way attending it.—The ſouth rampart might ſerve for an inner defence in caſe the enemy ſhould beat them from any part of the principal rampart, or it might be deſigned to protect the ſoldiers from any ſudden attack of the provincial Britons.—For many ages, this work hath been in ſo ruinous a condition, that it is impoſſible to diſcover its original dimenſions with certainty. From their appearance, it ſeems probable that the principal rampart was at leaſt 10 or 12 feet high, and the ſouth one not much leſs; but the north one was conſiderably lower. From the dimenſions of the ditch taken as it paſſes through a lime-ſtone quarry near Harlow hill, it appears to have been 9 feet deep, and 11 wide at the top, but ſomewhat narrower at the bottom. The north rampart was about 20 feet diſtant from the ditch.

(B) The verſes are theſe:

Animula vagula, blandula,
Hoſpes, comeſque corporis,
Quæ nunc abibis in loca
Pallidula, rigida, nudula,
Nec, ut ſoles, dabis jocos?

Thus tranſlated by Mr Pope:

Ah! fleeting ſpirit! wand'ring fire,
That long haſt warm'd my tender breaſt,
Muſt thou no more this frame inſpire?
No more a pleaſing cheerful gueſt?
Whither, ah whither art thou flying?
To what dark undiſcover'd ſhore?
Thou ſeem'ſt all trembling, ſhiv'ring, dying,
And wit and humour are no more!

Adrian. fal into an archiepiſcopal ſee. When he returned to Rome, he was received by the pope and cardinals with great marks of honour: and Pope Anaſtaſius, who ſucceeded Eugenius, happening to die at this time, Nicholas was unanimouſly choſen to the holy ſee, in November 1154, and he took the name of *Adrian*. When the news of his promotion reached England, King Henry II. ſent Robert abbot of St Alban's, and three biſhops, to Rome, to congratulate him on his election; upon which occaſion Adrian granted very conſiderable privileges to the monaſtery of St Alban's, particularly an exemption from all epiſcopal juriſdiction, excepting to the ſee of Rome. Adrian, in the beginning of his pontificate, boldly withſtood the attempts of the Roman people to recover their ancient liberty under the conſuls, and obliged thoſe magiſtrates to abdicate their authority, and leave the government of the city to the pope. In 1155, he drove the heretic Arnaud of Breſſe, and his followers, out of Rome. The ſame year he excommunicated William king of Sicily, who ravaged the territories of the church, and abſolved that prince's ſubjects from their allegiance. About the ſame time, Frederic king of the Romans, having entered Italy with a powerful army, Adrian met him near Sutrium, and concluded a peace with him. At this interview, Frederic conſented to hold the pope's ſtirrup whilſt he mounted on horſeback. After which, his holineſs conducted that prince to Rome, and in St Peter's church placed the imperial crown on his head, to the great mortification of the Roman people, who aſſembled in a tumultuous manner, and killed ſeveral of the Imperialiſts. The next year a reconciliation was brought about between the pope and the Sicilian king, that prince taking an oath to do nothing farther to the prejudice of the church, and Adrian granting him the title of *king of the two Sicilies*. He built and fortified ſeveral caſtles, and left the papal dominions in a more flouriſhing condition than he found them. But notwithſtanding all his ſucceſs, he was extremely ſenſible of the diſquietudes attending ſo high a ſtation; and declared to his countryman John of Saliſbury, that all the former hardſhips of his life were mere amuſement to the misfortunes of the popedom: that he looked upon St Peter's chair to be the moſt uneaſy ſeat in the world; and that his crown ſeemed to be clapped burning on his head*. He died September 1. 1159, in the fourth year and tenth month of his pontificate; and was buried in St Peter's church, near the tomb of his predeceſſor Eugenius. There are extant ſeveral letters, and ſome homilies, written by Pope Adrian.

* Baronius Annal. tom xii. an. 1154.

ADRIAN, cardinal-prieſt, of the title of St Chryſogonus, was a native of Cornetto in Tuſcany. Innocent VIII. ſent him nuncio into Scotland and into France; and after he had been clerk and treaſurer of the apoſtolic chamber, pope Alexander VI. whoſe ſecretary he had been, honoured him with the cardinal's hat. His life was a continued ſcene of odd alterations. He narrowly eſcaped death the day Alexander VI. poiſoned himſelf by miſtake. Afterward he drew upon himſelf the hatred of Julius II. ſo that he was obliged to go and hide himſelf in the mountains of Trent. Having been recalled by Leo X. he was ſo ungrateful, that he engaged in a conſpiracy againſt him. The pope pardoned his fault: but the cardinal, not caring to truſt to this, made his eſcape, and it could never be known exactly what was become of him. He was one of the firſt that effectually reformed the Latin ſtyle. He ſtudied Cicero with great ſucceſs, and made many excellent obſervations on the propriety of the Latin tongue. The treatiſe he compoſed *De ſermone Latino*, is a proof of this. He had begun a Latin tranſlation of the Old Teſtament. He wrote *De vera philoſophia:* This treatiſe was printed at Cologn 1548.

Adrian ‖ Adrianople.

ADRIAN VI. (Pope), was born at Utrecht in 1459. His father was not able to maintain him at ſchool, but he got a place at Louvain, in a college in which a certain number of ſcholars were maintained *gratis*. It is reported that he uſed to read in the night-time by the light of the lamps in the churches or ſtreets. He made a conſiderable progreſs in all the ſciences; led an exemplary life; and there never was a man leſs intriguing and forward than he was. He took his degree of doctor of divinity at Louvain; was ſoon after made canon of St Peter's, and profeſſor of divinity at Utrecht, and then dean of St Peters and vice-chancellor of the univerſity. He was obliged to leave an academical life, to be tutor to the archduke Charles. This young prince made no great progreſs under him: however, never was a tutor more conſiderably rewarded; for it was by Charles V.'s credit he was raiſed to the papal throne. Leo X. had given him the cardinal's hat in 1517. After this pope's death, ſeveral cabals in the conclave ended in the election of Adrian, with which the people of Rome were very much diſpleaſed. He would not change his name, and in every thing he ſhowed a great diſlike for all oſtentation and ſenſual pleaſures, though ſuch an averſion had been long ago out of date. He was very partial to Charles V. and did not enjoy much tranquillity under the triple crown. He lamented much the wicked morals of the clergy, and wiſhed to eſtabliſh a reformation of manners among them. He died Sept. 14. 1523.

ADRIANI (Joanni Battiſta), was born of a patrician family at Florence, in 1511. He wrote a Hiſtory of his own Times in Italian; which is a continuation of Guicciardini, beginning at the year 1536; to which Thuanus acknowledges himſelf greatly indebted: beſide which, he compoſed ſix funeral orations, on the emperor Charles V. and other noble perſonages; and is thought to have been the author of a long letter on ancient painters and ſculptors, prefixed to the third volume of Vaſari. He died at Florence in 1579.

ADRIANISTS, in eccleſiaſtical hiſtory, a ſect of heretics divided into two branches; the firſt were diſciples of Simon Magus, and flouriſhed about the year 34. Theodoret is the only perſon who has preſerved their name and memory; but he gives us no account of their origin. Probably this ſect, and the ſix others which ſprung from the Simonians, took their name from the particular diſciples of Simon. The ſecond were the followers of Adrian Hamſtead, the anabaptiſt; and held ſome particular errors concerning Chriſt.

ADRIANOPLE, a city of Turky in Europe, in the province of Romania, and the ſee of an archbiſhop under the patriarch of Conſtantinople. It is about ſeven or eight miles in circumference, including the old city and ſome gardens. The houſes are low, moſtly built of mud and clay, and ſome of brick: and the

ftreets are exceeding dirty. The walls and towers are in a great meafure fallen to decay. However, there is a beautiful bazar, or market, half a mile long, called Ali Baffa. It is a vaft arched building, with fix gates, and 365 well-furnifhed fhops, kept by Turks, Armenians, and Jews, who pay five crowns a-month for each fhop. The number of inhabitants of all nations and religions may be about 100,000: but it is dear living here, becaufe the provifions are brought from diftant places. The air is wholefome, and the country very pleafant in the fummer-time, on account of the river and ftreams that run near and about the city; the chief of which is the Mariza. Thefe promote and preferve the verdure of the gardens, meadows, and fields, for a confiderable part of the year. In the winter there is plenty of game. Near the principal bazar there is another, about a mile in length, covered with boards, with holes on each fide to let in the light. It is full of good fhops, which contain all kinds of commodities. Sultan Selim's mofque ftands on the fide of a hill, in the midft of the city; and hence this magnificent ftructure may be feen on all fides. Every thing made of gold and filver, jewels, piftols, fcimetars, &c. are fold in another part of the city, called by travellers the *bizeftein*, though it differs little from a bazar. This contains about 200 fhops, and is covered like the former: but the covering is fupported by two rows of large pillars. The grand vifier's palace is nothing more than a convenient houfe, after the Turkifh manner of building. The emperor's feraglio is a regular ftructure, in a plain near the river Tungia. It is two miles in compafs, and has feven gates, befides thofe of the gardens, which are feveral miles in circumference. The city is governed by a mullah cadi, who has an abfolute authority both in civil and criminal matters. In the time of the plague, or war, the grand fignior fometimes refides here. The Turks took this city from the Greeks in 1362, and made it the capital of the empire, till Mahomet II. took Conftantinople in 1453. E. Long. 26. 27. Lat. 41. 41.

ADROGATION, in Roman antiquities, a fpecies of adoption, whereby a perfon who was capable of choofing for himfelf was admitted by another into the relation of a fon. The word is compounded of *ad*, "to," and *rogare*, "to afk;" on account of a queftion put in the ceremony of it, Whether the adopter would take fuch a perfon for his fon? and another to the adoptive, Whether he confented to become fuch a perfon's fon?

ADSIDELLA, in antiquity, the table at which the flamens fat during the facrifices.

ADSTRICTION, among phyficians, a term ufed to denote the rigidity of any part.

ADUACA, or ATUACA, anciently a large and famous city of the Tungri; now a fmall and inconfiderable village, called *Tongeren*, in the bifhopric of Liege, to the north-weft of the city of Liege, in the territory of Hafpengow, on the rivulet Jecker, that foon after falls into the Maefe. E. Long. 5. 52. Lat. 50. 54.

ADVANCE, in the mercantile ftyle, denotes money paid before goods are delivered, work done, or bufinefs performed.

ADVANCED, in a general fenfe, denotes fomething pofted or fituated before another. Thus,

ADVANCED Ditch, in fortification, is that which furrounds the glacis or efplanade of a place.

ADVANCED Guard, or *Vanguard*, in the art of war, the firft line or divifion of an army, ranged or marching in order of battle; or, it is that part which is next the enemy, and marches firft towards them.

Advanced Guard, is more particularly ufed for a fmall party of horfe ftationed before the main-guard.

ADVANCER, among fportfmen, one of the ftarts or branches of a buck's attire, between the back antler and the palm.

ADUAR, in the Arabian and Moorifh cuftoms, a kind of ambulatory village, confifting of tents, which thefe people remove from one place to another, as fuits their conveniency.

ADVENT, in the calendar, properly fignifies the approach of the feaft of the nativity. It includes four fundays, which begin on St Andrew's day, or on the funday before or after it. During advent, and to the end of the octaves of epiphany, the folemnizing of marriage is forbid without a fpecial licence. It is appointed to employ the thoughts of Chriftians on the firft advent or coming of Chrift in the flefh, and his fecond advent or coming to judge the world. The primitive Chriftians practifed great aufterity during this feafon.

AD VENTREM INSPICIENDUM, in law, a writ by which a woman is to be fearched whether fhe be with child by a former hufband, on her with-holding of lands from the next, failing iffue of her own body.

ADVENTURE, in a general fenfe, fome extraordinary or accidental event. It alfo denotes a hazardous or difficult undertaking.

Bill of ADVENTURE, among merchants, a writing figned by a merchant, teftifying the goods mentioned in it to be fhipped on board a certain veffel belonging to another perfon, who is to run all hazards; the merchant only obliging himfelf to account to him for the produce.

ADVENTURE-Bay, in Van Diemen's land. There is a beautiful fandy beach, about two miles long, at the bottom of Adventure Bay, formed to all appearance by the particles which the fea wafhes from a fine white fand-ftone. This beach is very well adapted for hauling a feine. Behind it is a plain, with a brackifh lake, out of which we caught, by angling, fome bream and trout. The parts adjoining the bay are moftly hilly, and are an entire foreft of tall trees, rendered almoft impaffable by brakes of fern, fhrubs, &c. The foil on the flat land, and on the lower part of the hills, is fandy, or confifts of a yellowifh earth, and in fome parts of a reddifh clay; but further up the hills, it is of a grey tough caft. This country, upon the whole, bears many marks of being very dry, and the heat appears to be great. No mineral bodies, nor ftones of any other kind than the white fand-ftone, were obferved by us; nor could we find any vegetables that afforded fubfiftence for man. The foreft-trees are all of one kind, and generally quite ftraight: they bear clufters of fmall white flowers. The principal plants obferved, are wood-forrel, milk-wort, cudweed, bell-flower, gladiolus, famphire, and feveral kinds of fern: the only quadruped, a fpecies of opoffum, about twice the fize of a large rat. The kangooroo, found further northward in New Holland, may alfo be fuppofed to inhabit here, as fome of the inhabitants had pieces of the fkin of that animal.

The

The principal sorts of birds in the woods are brown hawks or eagles, crows, large pigeons, yellowish paroquets, and a species which we called *motacilla cyanea*, from the beautiful azure colour of its head and neck. On the shore were several gulls, black oyster-catchers, or sea-pies, and plovers of a stone-colour.

The inhabitants seemed mild and cheerful, with little of that wild appearance that savages in general have. They are almost totally devoid of personal activity or genius, and are nearly upon a par with the wretched natives of Terra del Fuego. They display, however, some contrivance in their method of cutting their arms and bodies in lines of different directions, raised above the surface of the skin. Their indifference for presents, their general inattention, and want of curiosity, were very remarkable, and testified no acuteness of understanding. Their complexion is a dull black, which they sometimes heighten by smutting their bodies, as was supposed, from their leaving a mark behind on any clean substance. Their hair is perfectly woolly, and is clotted with grease and red ochre, like that of the Hottentots. Their noses are broad and full, and the lower part of the face projects considerably. Their eyes are of a moderate size, and though they are not very quick or piercing, they give the countenance a frank, cheerful, and pleasing cast. Their teeth are not very white, nor well set, and their mouths are too wide: they wear their beards long, and clotted with paint. They are, upon the whole, well proportioned, though their belly is rather protuberant. Their favourite attitude is to stand with one side forward, and one hand grasping, across the back, the opposite arm, which, on this occasion, hangs down by the side that projects.

ADVENTURER, in a general sense, denotes one who hazards something.

ADVENTURERS, is particularly used for an ancient company of merchants and traders, erected for the discovery of lands, territories, trades, &c. unknown. The society of adventurers had its rise in Burgundy, and its first establishment from John Duke of Brabant in 1248, being known by the name of *The brotherhood of St Thomas à Becket*. It was afterwards translated into England, and successively confirmed by Edward III. and IV. Richard III. Henry IV. V. VI. and VII. who gave it the appellation of *Merchant Adventurers*.

ADVERB, in grammar, a particle joined to a verb, adjective, or participle, to explain their manner of acting or suffering; or to mark some circumstance or quality signified by them. The word is formed from the preposition *ad*, "to," and *verbum*, "a verb;" and signifies literally a word joined to a verb, to show how, when, or where, one is, does, or suffers; as, the boy paints *neatly*, writes *ill;* the house stands *there*, &c. See GRAMMAR.

ADVERSARIA, among the ancients, a book of accounts, not unlike our journals or day-books. It is more particularly used for a kind of common-place-book. See COMMON-PLACE-BOOK.

ADVERSATIVE, in grammar, a word expressing some difference between what goes before and what follows it. Thus, in the phrase, *he is an honest man, but a great enthusiast*, the word *but* is an adversative conjunction.

ADVERSATOR, in antiquity, a servant who attended the rich in returning from supper, to give them notice of any obstacles in the way, at which they might be apt to stumble.

ADVERTISEMENT, in a general sense, denotes any information given to persons interested in an affair; and is more particularly used for a brief account of an affair inserted in the public papers, for the information of all concerned.

ADULA (anc. geog.), a mountain in Rhætia, or the country of the Grisons, part of the Alps, in which are the fountains of the Rhine; now *St Godhards*.

ADULE, or ADULIS, (anc. geog.) a town of Egypt built by fugitive slaves, distant from its port on the Red Sea 20 stadia. Pliny calls the inhabitants *Adulitae*. The epithet is either *Adulitanus;* as, *Monumentum Adulitanum*, on the pompous inscription of the statue of Ptolemy Euergetes, published by Leo Alatius at Rome in 1631, and to be found in Spon and Thevenot: Or, *Adulicus;* as *Adulicus Sinus*, a part of the Red Sea.

ADULT, an appellation given to any thing that is arrived at maturity: Thus we say, an adult person, an adult plant, &c. Among civilians, it denotes a youth between 14 and 25 years of age.

ADULTERER, a man who commits adultery. See ADULTERY.

ADULTERESS, a woman guilty of ADULTERY. An adulteress, by our law, undergoes no temporal punishment whatever, except the loss of her dower; and she does not lose even that, if her husband is weak enough to be reconciled to her, and cohabit with her after the offence committed. 13 Ed. I. cap. 34.

But it is to be observed, that adulteresses are such either by the canon or civil law. According to the former, a woman is an adulteress who, either being herself married, converses carnally with another man; or being single herself, converses with a man that is married. According to the latter, she is not an adulteress, if she be not herself in the married state, though she converses with a man that is. The crime, in this case, was more properly called *stuprum* than *adulterium*. Hence, among the Romans, the word *adultera*, "adulteress," differed from *pellex*, which denoted a single woman who cohabited with a married man: and *pellex* differed from *concubina*, which signified her who had only intercourse with an unmarried man. The former was reputed infamous, and the latter innocent.

ADULTERATION, the act of debasing, by an improper mixture, something that was pure and genuine.

The word is Latin, formed of the verb *adulterare*, "to corrupt," by mingling something foreign to any substance. We have laws against the adulteration of coffee, tea, tobacco, snuff, wine, beer, bread, wax, hair-powder, &c.

ADULTERATION of Coin, properly imports the making, or casting of a wrong metal, or with too base or too much alloy.

Adulterations of coins are effected divers ways; as, by forging another stamp or inscription; by mixing impure metals with the gold or silver: most properly, by making use of a wrong metal, or an undue alloy, or too great an admixture of the baser metals with gold or silver. Counterfeiting the stamp, or clipping and

and leſſening the weight, do not ſo properly come under the denomination of *adulterating*.—Evelyn gives rules and methods, both of adulterating and detecting adulterated metals, &c.—*Adulterating* is ſomewhat leſs extenſive than *debaſing*, which includes diminiſhing, clipping, &c.

To adulterate or debaſe the current coin, is a capital crime in all nations.—The ancients puniſhed it with great ſeverity: among the Egyptians both hands were cut off; and by the civil law, the offender was thrown to wild beaſts. The emperor Tacitus enacted, that counterfeiting the coin ſhould be capital; and under Conſtantine it was made treaſon, as it is alſo among us. The adulterating of gems is a curious art, and the methods of detecting it no leſs uſeful. Nichols Lapid. p. 18.

ADULTERINE, in the civil law, is particularly applied to a child iſſued from an adulterous amour or commerce. Adulterine children are more odious than the illegitimate offspring of ſingle perſons.—The Roman law even refuſes them the title of natural children; as if nature diſowned them.—Adulterine children are not eaſily diſpenſed with for admiſſion to orders. Thoſe are not deemed adulterine, who are begotten of a woman openly married, through ignorance of a former wife being alive.—By a decree of the parliament of Paris, adulterine children are declared not legitimated by the ſubſequent marriage of the parties, even though a papal diſpenſation be had for ſuch marriage, wherein is a clauſe of legitimation.

Adulterine Marriages, in St Auguſtine's ſenſe, denote ſecond marriages, contracted after a divorce.

ADULTERY, an unlawful commerce between one married perſon and another, or between a married and unmarried perſon.

Puniſhments have been annexed to adultery in moſt ages and nations, though of different degrees of ſeverity. In many it has been capital; in others venial, and attended only with ſlight pecuniary mulcts. Some of the penalties are ſerious, and even cruel; others of a jocoſe and humorous kind. Even contrary things have been enacted as puniſhments for adultery. By ſome laws, the criminals are forbid marrying together, in caſe they became ſingle; by others, they are forbid to marry any beſides each other; by ſome, they are incapacitated from ever committing the like crime again; by others, they are glutted with it till it becomes downright nauſeous.

Among the rich Greeks, adulterers were allowed to redeem themſelves by a pecuniary fine; the woman's father, in ſuch caſes, returned the dower he had received from her huſband, which ſome think was refunded by the adulterer. Another puniſhment among thoſe people was, putting out the eyes of adulterers.

The Athenians had an extraordinary way of puniſhing adulterers, called παρατιλμὸς ῥαφανιδωσις, practiſed at leaſt on the poorer ſort who were not able to pay the fines. This was an awkward ſort of empalement, performed by thruſting one of the largeſt radiſhes up the anus of the adulterer, or, in defect thereof, a fiſh with a large head, called *mugil*, "mullet." Alcæus is ſaid to have died this way, though it is doubted whether the puniſhment was reputed mortal. Juvenal and Catullus ſpeak of this cuſtom, as received alſo among the Romans, though not authoriſed by an expreſs law, as it was among the Greeks.

There are various conjectures concerning the ancient puniſhment of Adultery among the Romans. Some will have it to have been made capital by a law of Romulus, and again by the twelve tables. Others, that it was firſt made capital by Auguſtus; and others, not before the emperor Conſtantine. The truth is, the puniſhment in the early days was very various, much being left to the diſcretion of the huſband and parents of the adulterous wife, who exerciſed it differently, rather with the ſilence and countenance of the magiſtrate than any formal authority from him. Thus we are told, the wife's father was allowed to kill both parties, when caught in the fact, provided he did it immediately, killed both together, and as it were with one blow. The ſame power ordinarily was not indulged the huſband, except the crime were committed with ſome mean or infamous perſon; tho', in other caſes, if his rage carried him to put them to death, he was not puniſhed as a murderer. On many occaſions, however, revenge was not carried ſo far; but mutilating, caſtrating, cutting off the ears, noſes, &c. ſerved the turn. The puniſhment allotted by the *lex Julia*, was not, as many have imagined, death; but rather baniſhment, or deportation, being interdicted fire and water: though Octavius appears, in ſeveral inſtances, to have gone beyond his own law, and to have put adulterers to death. Under Macrinus, many were burnt at a ſtake. Conſtantine firſt by law made the crime capital. Under Conſtantius and Conſtans, adulterers were burnt, or ſewed in ſacks and thrown into the ſea. Under Leo and Marcian, the penalty was abated to perpetual baniſhment, or cutting off the noſe. Under Juſtinian, a further mitigation was granted, at leaſt in favour of the wife, who was only to be ſcourged, loſe her dower, and be ſhut up in a monaſtery: after two years, the huſband was at liberty to take her back again; if he refuſed, ſhe was ſhaven, and made a nun for life: But it ſtill remained death in the huſband. The reaſon alleged for this difference is, that the woman is the weaker veſſel. Matthæus declaims againſt the empreſs Theodora, who is ſuppoſed to have been the cauſe of this law, as well as of others procured in favour of that ſex from the emperor.

Under Theodoſius, women convicted of this crime were puniſhed after a very ſingular manner, viz. by a public conſtupration; being locked up in a narrow cell, and forced to admit to their embraces all the men that would offer themſelves. To this end, the gallants were to dreſs themſelves on purpoſe, having ſeveral little bells faſtened to their clothes, the tinkling of which gave notice to thoſe without of every motion. This cuſtom was again aboliſhed by the ſame prince.

By the Jewiſh law, adultery was puniſhed by death in both parties, where they were both married, or only the woman. The Jews had a particular method of trying, or rather purging, an adultereſs, or a woman ſuſpected of the crime, by making her drink the bitter waters of jealouſy; which, if ſhe were guilty, made her ſwell.

Among the Mingrelians, according to Chardin, adultery is puniſhed with the forfeiture of a hog, which is uſually eaten in good friendſhip between the gallant, the adultereſs, and the cuckold. In ſome parts of the Indies, it is ſaid any man's wife is permitted to proſtitute herſelf to him who will give an elephant for the uſe of her; and it is reputed no ſmall glory to her to

Adultery. have been rated so high. Adultery is said to be so frequent at Ceylon, that not a woman but practises it, notwithstanding its being punishable with death. Among the Japanese, and divers other nations, adultery is only penal in the woman. Among the Abyssinians, the crime of the husband is said to be only punished on the innocent wife. In the Marian islands, on the contrary, the woman is not punishable for adultery; but if the man go astray he pays severely: the wife and her relations waste his lands, turn him out of his house, &c. Among the Chinese, there is reason to conclude that adultery is not capital; for it is said that fond parents will make a contract for their daughters future husbands to allow them the indulgence of a gallant.

In Spain, they punished adultery in men by cutting off that part which had been the instrument of the crime. In Poland, before Christianity was established, they punished adultery and fornication in a very particular manner: the criminal they carried to the market-place, and there fastened him by the testicles with a nail; laying a razor within his reach, and leaving him under a necessity, either of doing justice upon himself or of perishing in that condition.

The Saxons formerly burnt the adulteress, and over her ashes erected a gibbet, whereon the adulterer was hanged. In this kingdom, likewise, adultery, by the ancient laws, was severely punished. King Edmund the Saxon ordered adultery to be punished in the same manner as homicide; and Canute the Dane ordered that a man who committed adultery should be banished, and that the woman should have her nose and ears cut off. In the time of Henry I. it was punished with the loss of eyes and genitals.

In Britain, adultery is reckoned a spiritual offence, that is, cognizable by the spiritual courts, where it is punished by fine and penance. The common law takes no farther notice of it, than to allow the party grieved an action and damages. This practice is often censured by foreigners, as making too light of a crime, the bad consequences of which, public as well as private, are so great. It has been answered, that perhaps this penalty, by civil action, is more wisely calculated to prevent the frequency of the offence, which ought to be the end of all laws, than a severer punishment. He that by a judgment of law is, according to circumstances, stripped of great part of his fortune, thrown into prison till he can pay it, or forced to fly his country, will, no doubt, in most cases, own that he pays dearly for his amusement.

As to the moral turpitude of this offence, some have vainly endeavoured to deny or explain it away by various arguments, and even by an appeal to scripture. On the part of the *man* who solicits the chastity of a married woman, it certainly includes the crime of SEDUCTION, and is attended with mischief still more complicated and extensive: It creates a new sufferer, the injured husband, upon whose simplicity and affection is inflicted a wound the most painful and incurable that human nature knows. The infidelity of the *woman* is aggravated by cruelty to her children, who are generally involved in their parents shame, and always made unhappy by their quarrel.

It has been argued, that these consequences ought less to be attributed to the crime than to the discovery. But, in the first place, the crime could not be discovered unless it were committed, and the commission is never secure from discovery. 2*dly*, If adulterous connections were allowable whenever the parties could hope to escape detection, which is the conclusion to which this argument leads, the husband would be left no other security for his wife's chastity, than in her want of opportunity or temptation: which would probably deter most men from marrying; or render marriage a state of continual jealousy and alarm to the husband, which would end in the slavery and confinement of the wife.

The marriage-vow is "witnessed before God," and accompanied with circumstances of solemnity and religion, which approach to the nature of an oath. The married offender, therefore, incurs a crime little short of perjury, and the seduction of a married woman is little less than subornation of perjury:—and this guilt is independent of the discovery.

But the usual apology for adultery is the prior transgression of the other party; and so far, indeed, as the bad effects of adultery are anticipated by the conduct of the husband or wife who offends first, the guilt of the second offender is extenuated. But this can never amount to a justification; unless it could be shown that the obligation of the marriage-vow depends upon the condition of reciprocal fidelity; a construction which appears founded neither in expediency, nor in the terms of the vow, nor in the design of the legislature which prescribed the marriage-rite. The way of considering the offence upon the footing of *provocation* and *retaliation*, is a childish trifling with words.

"Thou shalt not commit adultery," was an interdict delivered by God himself; yet scripture has been adduced as giving countenance to the crime. As Christ told the woman taken in adultery, "Neither do *I condemn* thee," we must believe, it is said, that he deemed her conduct either not criminal, or at least not a crime of the heinous nature we represent it to be. But from a more attentive examination of the case, it will be evident that nothing can be concluded from it favourable to such an opinion. The transaction is thus related *: 'Early in the morning Jesus came again into the temple, and all the people came unto him; and he sat down and taught them; and the Scribes and Pharisees brought unto him a woman taken in adultery; and when they had set her in the midst, they say unto him, Master, this woman was taken in adultery, in the very act; now Moses in the law commanded that such should be stoned, but what sayest thou? This they said tempting him, that they might have to accuse him: but Jesus stooped down, and with his finger wrote on the ground, as though he heard them not. So when they continued asking him, he lift up himself, and said unto them, He that is without sin amongst you, let him first cast a stone at her; and again he stooped down and wrote on the ground: and they which heard it, being convicted by their own conscience, went out one by one, beginning at the eldest, even unto the last; and Jesus was left alone, and the woman standing in the midst. When Jesus had lift up himself, and saw none but the woman, he said unto her, Woman, where are those thine accusers? Hath no man condemned thee? She said unto him, No man, Lord: and he said unto her, *Neither do I condemn thee;* go and sin no more.'

* St John's Gospel, ch. viii.

'This

Adultery.

'This they said tempting him, that they might 'have to accuse him;' that is, to draw him into an exercise of judicial authority, that they might have to accuse him before the Roman governor of usurping or intermeddling with the civil government.

Paley's *Moral and Political Philosophy*, p. 258. 3d edit. 4to.

"This was their design; and Christ's behaviour throughout the whole affair proceeded from a knowledge of this design, and a determination to defeat it. He gives them at first a cold and sullen reception, well suited to the insidious intention with which they came: 'he stooped down, and with his finger wrote on 'the ground as though he heard them not.' 'When 'they *continued* asking him,' when they teazed him to speak, he dismissed them with a rebuke, which the impertinent malice of their errand, as well as the secret character of many of them, deserved: 'he that is 'without sin (that is, this sin) among you, let him 'first cast a stone at her.' This had its effect. Stung with the reproof, and disappointed of their aim, they stole away one by one, and left Jesus and the woman alone. And then follows the conversation, which is the part of the narrative most material to our present subject. 'Jesus saith unto her, Woman, where are 'those thine accusers? Hath no man condemned thee? 'She said, No man, Lord. And Jesus said unto her, 'Neither do I condemn thee; go and sin no more.' Now, when Christ asked the woman, 'Hath no man '*condemned* thee?' he certainly spoke, and was understood by the woman to speak, of a legal and judicial condemnation; otherwise her answer, 'No man, Lord,' was not true. In every other sense of condemnation, as blame, censure, reproof, private judgment, and the like, many had condemned her; all those, indeed, who brought her to Jesus. If then a judicial sentence was what Christ meant by *condemning* in the question, the common use of language requires us to suppose that he meant the same in his reply, 'Neither do I con'demn thee:' *i. e.* I pretend to no judicial character or authority over thee; it is no office or business of mine to pronounce or execute the sentence of the law. When Christ adds, 'Go and sin no more,' he in effect tells her that she had sinned already; but as to the degree or quality of the sin, or Christ's opinion concerning it, nothing is declared, or can be inferred, either way."

It has been controverted, whether adultery may be lawfully committed in war, with the enemies wives? The answer is in the negative, and the authorised practice of civilized nations is agreeable to this. It has also been a famous question, whether it be lawful for a woman to commit adultery with the consent of her husband, and for the procuring some great good to him? St Austin apparently allows of it; at least, does not condemn it *.

* *De Serm. Dom. in Mont.* lib. i. cap. 16. § 49. *et De Civ. Dei*, lib. xvi. cap. 25.

It has likewise been a dispute, whether it be lawful for one of the parties married to commit adultery, with the consent of the other, for the sake of having children? Of which we have instances in Abraham, who, on this account, conversed with Hagar; and likewise among the Greeks and Romans. Pollman, a German professor, has a dissertation on the husband's right to alienate his wife's body to another's use.

It is much disputed, whether adultery dissolves the bond of matrimony, and be a sufficient cause of divorce, so that the parties may marry again. This was allowed in the ancient church, and is still continued in the Greek, as well as the Lutheran and Calvinist churches. Romanists, however, disallow of it, and the council of Trent even anathematized those who maintain it; though the canon of anathematization was mitigated in deference to the republic of Venice, in some of whose dominions, as Zant, Cephalonia, &c. the contrary usage obtains. The ecclesiastical courts in England so far agree with the papists, that they only grant a divorce *à mensa et thoro*, in case of adultery; so that a complete divorce, to enable the parties to marry again, cannot be had without an act of parliament.

Adultery, Advocate.

ADULTERY is also used in ancient customs, for the punishment or fine imposed for that offence, or the privilege of prosecuting for it. In which sense, *adulterium* amounts to the same with what the Saxons call *legerwita*.

ADULTERY is sometimes used, in a more extensive sense, for any species of impurity or crime, against the virtue of chastity; and in this sense divines understand the seventh commandment.

ADULTERY is also used, especially in scripture, for idolatry, or departing from the true God, to the worship of a false one.

ADULTERY is also used, in ecclesiastical writers, for a person's invading or intruding into a bishopric during the former bishop's life. The reason of the appellation is, that a bishop is supposed to contract a kind of spiritual marriage with his church. The translation of a bishop from one see to another was also reputed a species of adultery; on the supposition of its being a kind of second marriage, which, in those days, was esteemed a degree of adultery. This conclusion was founded on that text of St Paul, *Let a bishop be the husband of one wife*, by a forced construction of church for wife and of bishop for husband. Du-Cange.

ADULTERY is also used, in ancient naturalists, for the act of ingrafting one plant upon another. In which sense, Pliny speaks of the adulteries of trees, *arborum adulteria*, which he represents as contrary to nature, and a piece of luxury, or needless refinement.

ADVOCATE, among the Romans, a person skilled in their law, who undertook the defence of causes at the bar. The Roman advocates answered to one part of the office of a barrister in England, viz. the pleading part; for they never gave counsel, that being the business of the *jurisconsulti*.

The Romans, in the first ages of their state, held the profession of an advocate in great honour; and the seats of their bar were crowded with senators and consuls; they, whose voices commanded the people, thinking it an honour to be employed in defending them. They were styled *comites*, *honorati*, *clarissimi*, and even *patroni*; as if their clients were not less obliged to them than freed men to their masters. The bar was not at that time venal. Those who aspired to honours and offices took this way of gaining an interest in the people, and always pleaded *gratis*. But no sooner were luxury and corruption introduced into the commonwealth, than the bar became a sharer in them. Then it was that the senators let out their voices for pay, and zeal and eloquence were sold to the highest bidder. To put a stop to this abuse, the

Advocates. tribune Cincius procured a law to be paſſed, called from him *Lex Cincia*, whereby the advocates were forbid to take any money of their clients. It had before this been prohibited the advocates to take any preſents or gratuities for their pleading. The emperor Auguſtus added a penalty to it: notwithſtanding which, the advocates played their part ſo well, that the emperor Claudius thought it an extraordinary circumſtance, when he obliged them not to take above eight great ſeſterces, which are equivalent to about 64 l. Sterling, for pleading each cauſe.

Advocate is ſtill uſed, in countries and courts where the civil law obtains, for thoſe who plead and defend the cauſes of clients truſted to them.

Advocate of a City, in the German polity, a magiſtrate appointed in the emperor's name to adminiſter juſtice.

Advocate is more particularly uſed, in church hiſtory, for a perſon appointed to defend the rights and revenues of a church or religious houſe. The word *advocatus*, or *advowee*, is ſtill retained for what we uſually call the *patron*, or he who has the advowſon, or right of preſentation, in his own name.

Conſiſtorial Advocates; officers of the conſiſtory at Rome, who plead in all oppoſitions to the diſpoſal of benefices in that court: they are ten in number.

Elective Advocates, thoſe choſen by the abbot, biſhop, or chapter; a particular licence being had from the king, or prince, for that purpoſe. The elections were originally made in the preſence of the count of the province.

Feudal Advocates. Theſe were of the military kind, who, to make them more zealous for the intereſt of the church, had lands granted them in fee, which they held of the church, and did homage, and took an oath of fidelity to the biſhop or abbot. Theſe were to lead the vaſſals of the church to war, not only in private quarrels of the church itſelf, but in military expeditions for the king's ſervice, in which they were the ſtandard-bearers of their churches.

Fiſcal Advocate, *fiſci advocatus*, in Roman antiquity, an officer of ſtate under the Roman emperors, who pleaded in all cauſes wherein the *fiſcus*, or private treaſury, was concerned.

Juridical Advocates, in the middle age, were thoſe who from attending cauſes in the court of the comes, or count of the province, became judges themſelves, and held courts of their vaſſals thrice a-year, under the name of the *tria placita generalia*. In conſideration of this further ſervice, they had a particular allowance of one third part of all fines, or mulcts, impoſed on defaulters, &c. beſides a proportion of diet for themſelves and ſervants.

Matricular Advocates, were the advocates of the mother or cathedral churches.

Military Advocates, thoſe appointed for the defence of the church, rather by arms and authority than by pleading and eloquence. Theſe were introduced in the times of confuſion, when every perſon was obliged to maintain their own property by force; biſhops and abbots not being permitted to bear arms, and the ſcholaſtic or gowned advocates being equally unacquainted with them, recourſe was had to knights, noblemen, ſoldiers, or even to princes.

Nominative Advocates, thoſe appointed by a king or pope. Sometimes the churches petitioned kings, &c. to appoint them an advocate; at other times this was done of their own accord. By ſome regulations, no perſon was capable of being elected advocate, unleſs he had an eſtate in land in the ſame county. Advocates.

Regular Advocates, thoſe duly formed and qualified for their profeſſion, by a proper courſe of ſtudy, the requiſite oath, ſubſcription, licence, &c.

Subordinate Advocates, thoſe appointed by other ſuperior ones, acting under them, and accountable to them. There were various reaſons for the creation of theſe ſubordinate advocates; as, the ſuperior quality of the principal advocate, his being detained in war, or being involved in other affairs; but chiefly the too great diſtance of ſome of the church-lands, and their lying in the dominions of foreign princes.

Supreme or *Sovereign Advocates*, were thoſe who had the authority in chief; but acted by deputies or ſubordinate advocates. Theſe were called alſo *principal*, *greater*, and ſometimes *general* advocates. Such in many caſes were kings, &c. when either they had been choſen advocates, or became ſuch by being founders or endowers of churches. Princes had alſo another title to advocateſhip, ſome of them pretending to be *advocati nati* of the churches within their dominions.

Advocates, in the Engliſh courts, are more generally called *counſel*. See Counsel.

Faculty of Advocates, in Scotland, a reſpectable body of lawyers, who plead in all cauſes before the Courts of Seſſion, Juſticiary, and Exchequer. They are alſo intitled to plead in the houſe of peers, and other ſupreme courts in England.

In the year 1660, the faculty founded a library upon a very extenſive plan, ſuggeſted by that learned and eminent lawyer Sir George M'Kenzie of Roſehaugh, advocate to king Charles II. and king James VII. who enriched it with many valuable books. It has been daily increaſing ſince that time, and now contains not only the beſt collection of law-books in Europe, but a very large and ſelect collection of books on all ſubjects. Beſides, this library contains a great number of original manuſcripts, and a vaſt variety of Jewiſh, Grecian, Roman, Scots, and Engliſh coins and medals.

A candidate for the office of an advocate undergoes three ſeveral trials: The firſt is in Latin, upon the civil law and Greek and Roman antiquities; the ſecond, in Engliſh, upon the municipal law of Scotland; and, in the third, he is obliged to defend a Latin theſis, which is impugned by three members of the faculty. Immediately before putting on the gown, the candidate makes a ſhort Latin ſpeech to the lords, and then takes the oaths to the government and *de fideli*.

The faculty at preſent conſiſts of above 200 members. As an advocate or lawyer is eſteemed the genteeleſt profeſſion in Scotland, many gentlemen of fortune take the degree of advocate, without having any intention of practiſing at the bar. This circumſtance greatly increaſes their number, gives dignity to the profeſſion, and enriches their library and public fund. It is from this reſpectable body that all vacancies on the bench are generally ſupplied.

Lord Advocate, or *King's Advocate*, one of the eight great officers of ſtate in Scotland, who as ſuch

sat in parliament without election. He is the principal crown-lawyer in Scotland. His business is to act as a public prosecutor, and to plead in all causes that concern the crown; but particularly in such as are of a criminal nature. The office of king's advocate is not very ancient: It seems to have been established about the beginning of the 16th century. Originally he had no power to prosecute crimes without the concurrence of a private party; but, in the year 1597, he was empowered to prosecute crimes at his own instance. He has the privilege of pleading in court with his hat on. This privilege was first granted to Sir Thomas Hope; who having three sons lords of session, it was thought indecent that the father should plead uncovered before the sons, who as judges sat covered.

Bill of ADVOCATION, in Scots law, a writing drawn up in the form of a petition; whereby a party, in an action before an inferior court, applies to the supreme court, or court of Session, for calling the action from the inferior court before itself.

Letters of Advocation, in Scots law, the decree or warrant of the court of Session upon cognisance of the facts set forth in the bill, drawn up in the form of a summons, and passing under the signet, discharging the inferior judge and all others from further procedure in the cause, and advocating it to itself.

ADVOWEE, in ancient customs and law books, denotes the advocate of a church, religious house, or the like. There were advowees of cathedrals, abbeys, monasteries, &c. Thus, Charlemagne had the title of advowee of St Peter's; king Hugh, of St Riquier; and Bolandus mentions some letters of pope Nicholas, by which he constituted king Edward the Confessor, and his successors, advowees of the monastery at Westminster, and of all the churches in England. These advowees were the guardians, protectors, and administrators of the temporal concerns of the churches, &c. and under their authority were passed all contracts which related to them. It appears also, from the most ancient charters, that the donations made to churches were conferred on the persons of the advowees. They always pleaded the causes of the churches in court, and distributed justice for them, in the places under their jurisdiction. They also commanded the forces furnished by their monasteries, &c. for the war; and even were their champions, and sometimes maintained duels for them.

This office is said to have been first introduced in the fourth century, in the time of Stillico; though the Benedictines do not fix its origin before the eighth century. By degrees, men of the first rank were brought into it, as it was found necessary either to defend with arms or to protect with power and authority. In some monasteries they were only called *conservators*; but these, without the name, had all the functions of advowees. There were also sometimes several sub-advowees, or sub-advocates, in each monastery, who officiated instead of the advowees themselves; which, however, proved the ruin of monasteries; those inferior officers running into great abuses.

Hence also, husbands, tutors, and every person in general, who took upon him the defence of another, were denominated *advowees*, or advocates. Hence several cities had their advowees; which were established long after the ecclesiastical ones, and doubtless from

their example. Thus we read in history of the advowees of Augsburg, of Arras, &c.

The *vidames* assumed the quality of advowees; and hence it is, that several historians of the eighth century confound the two functions together. Hence also it is, that several secular lords in Germany bear mitres for their crests, as having anciently been advowees of the great churches.

Spelman distinguishes two kinds of ecclesiastical advowees.—The one, of causes or processes, *advocati causarum*; the other, of territory or lands, *advocati soli*. The former were nominated by the king, and were usually lawyers, who undertook to plead the causes of the monasteries. The other, which still subsist, and are sometimes called by their primitive name, *advowees*, though more usually *patrons*, were hereditary; as being the founders and endowers of churches, &c. or their heirs.

Women were sometimes advowees, *advocatissæ*. And, in effect, the canon law mentions some who had this title, and who had the same right of presentation, &c. in their churches which the advowees themselves had. In a stat. 25 Edw. III. we meet with *advowee paramount* for the highest patron; that is, the king.

ADVOWSON, or Advowzen, in common law, signifies a right to present to a vacant benefice. Advowson is so called, because the right of presenting to the church was first gained by such as were founders, benefactors, or maintainers of the church.

Though the nomination of fit persons to officiate in every diocese was originally in the bishop, yet they were content to let the founders of churches have the nomination of the persons to the churches so founded, reserving to themselves a right to judge of the fitness of the persons so nominated.

Advowsons formerly were most of them appendant to manors, and the patrons were parochial barons: the lordship of the manor and patronage of the church were seldom in different hands, until advowsons were given to religious houses. But of late times the lordship of the manor and advowson of the church have been divided.

Advowsons are *presentative*, *collative*, or *donative*: *presentative*, where the patron presents or offers his clerk to the bishop of the diocese, to be instituted in his church; *collative*, where the benefice is given by the bishop, as original patron thereof, or by means of a right he has acquired by lapse; *donative*, as where the king or other patron does, by a single donation in writing, put the clerk into possession, without presentation, institution, or induction.

Sometimes, anciently, the patron had the sole nomination of the prelate, abbot, or prior; either by investiture (*i. e.* delivery of a pastoral staff), or by direct presentation to the diocesan; and if a free election was left to the religious, yet a *conge d'elire*, or licence of election, was first to be obtained of the patron, and the person elected was confirmed by him. If the founder's family became extinct, the patronage of the convent went to the lord of the manor. Unless the several colleges in the universities be restrained in the number of advowsons they may receive, it is argued they will in time acquire such a stock as to frustrate the design of their foundation (which is the education of youth, by creating too quick a succession of fellows:

lows; ſo that there will not be in the colleges a ſufficient number of perſons of competent age, knowledge, and experience, to inſtruct and form the minds of the youth.—In ſome colleges the number of advowſons is ſaid to be already two thirds, or more, of the number of fellows.—It is objected, on the other ſide, that the ſucceſſion of fellows may be too ſlow as well as too quick; whereby perſons well qualified may be detained ſo long in colleges as not to have ſtrength or activity enough left for the diſcharge of parochial functions.

Colleges holding more advowſons in number than a moiety of the fellows, are not capable of purchaſing more. Grants of advowſons by papiſts are void. 9 Geo. II. c. 36. § 5. 11 Geo. II. c. 17. § 5.

Advowſons are temporal inheritances and lay fees; they may be granted by deed or will, and are aſſets in the hands of heirs or executors. Preſentations to advowſons for money, or other reward, are void. 31 Eliz. cap. 6.

In Scotland, this right is called *patronage*. See Patronage.

ADUST, Adustus, among phyſicians, &c. is applied to ſuch humours as by long heat become of a hot and fiery nature. Such is choler ſuppoſed to be. Melancholy is uſually conſidered as black and aduſt bile. Blood is ſaid to be aduſt, when, by reaſon of ſome extraordinary heat, its more ſubtile parts are all evaporated, leaving the groſſer, with all the impurities therein, half torrified.

ADY, in natural hiſtory, a name given to the palm-tree of the iſland of St Thomas. It is a tall tree, with a thick, bare, upright ſtem, growing ſingle on its root, of a thin light timber, and full of juice. The head of this tree ſhoots into a vaſt number of branches, which being cut off, or an inciſion being made therein, afford a great quantity of ſweet juice, which fermenting ſupplies the place of wine among the Indians. The fruit of this tree is called by the Portugueſe *Caryoces* and *Catioſſe*; and by the black natives, *Abanga*. This fruit is of the ſize and ſhape of a lemon; and contains a kernel, which is good to eat. The fruit itſelf is eat roaſted, and the raw kernels are often mixed with mandioc meal. Theſe kernels are ſuppoſed very cordial. An oil is alſo prepared from this fruit, which anſwers the purpoſe of oil or butter. This oil is alſo uſed for anointing ſtiff and contracted parts of the body.

ADYNAMIA, in medicine, debility, or weakneſs, from ſickneſs.

ADYNAMON, among ancient phyſicians, a kind of weak factitious wine, prepared from muſt boiled down with water; to be given to patients to whom genuine wine might be hurtful.

ADYTUM, in pagan antiquity, the moſt retired and ſacred place of their temples, into which none but the prieſts were allowed to enter. The *Sanctum Sanctorum* of the temple of Solomon was of the nature of the pagan adytum, none but the high prieſt being admitted into it, and he but once a-year.

ADZE, or Addice, a cutting tool of the ax kind; having its blade made thin and arching, and its edge at right angles to the handle; chiefly uſed for taking off thin chips of timber or boards, and for paring away certain irregularities which the ax cannot come at. The adze is uſed by carpenters, but more by coopers, as being convenient for cutting the hollow ſides of boards, &c. It is ground from a baſe on its inſide to its outer edge; ſo that, when it is blunt, they cannot conveniently grind it without taking its helve out of the eye.

AE, or Æ, a diphthong compounded of A and E. Authors are by no means agreed as to the uſe of the *ae* in Engliſh words.—Some, out of regard to etymology, inſiſt on its being retained in all words, particularly technical ones, borrowed from the Greek and Latin; while others, from a conſideration that it is no proper diphthong in our language, its ſound being no other than that of the ſimple *e*, contend that it ought to be entirely diſuſed; and, in fact, the ſimple *e* has of late been adopted inſtead of the Roman *æ*, as in the word *equator*, &c.

ÆACEA, in Grecian antiquity, ſolemn feſtivals and games celebrated at Ægina, in honour of Æacus.

ÆACUS, the ſon of Jupiter by Ægina. When the iſle of Ægina was depopulated by a plague, his father, in compaſſion to his grief, changed all the ants upon it into men and women, who were called *Myrmidons*, from μυρμηξ, *an ant*. The foundation of the fable is ſaid to be, that when the country had been depopulated by pirates, who forced the few that remained to take ſhelter in caves, Æacus encouraged them to come out, and by commerce and induſtry recover what they had loſt. His character for juſtice was ſuch, that, in a time of univerſal drought, he was nominated by the Delphic oracle to intercede for Greece, and his prayer was anſwered. See the article Ægina. The Pagans alſo imagined that Æacus, on account of his impartial juſtice, was choſen by Pluto one of the three judges of the dead: and that it was his province to judge the Europeans.

ÆBURA (anc. geog.), a town of Spain, in Eſtremadura, on the river Guadiana, to the weſt of Merida, now called *Talavera*. W. Long. 7. 15. Lat. 38. 40.

ÆCHMALOTARCHA, in Jewiſh antiquity, a title given to the principal leader or governor of the Hebrew captives reſiding in Chaldea, Aſſyria, and the neighbouring countries. This magiſtrate was called by the Jews *roſch-galath*, *i. e.* the chief of the captivity: but the above term, of like import in the Greek, is that uſed by Origen and others who wrote in the Greek tongue.

The Jewiſh writers aſſure us, that the *æchmalotarchæ* were only to be choſen out of the tribe of Judah. The eaſtern Jews had their princes of the captivity, as the weſtern Jews their patriarchs. The Jews are ſtill ſaid to have an *æchmalotarcha* at Babylon, but without the authority of the ancient ones. Baſnage Hiſt. Jews, and Prideaux's Connection.

ÆCULANUM (anc. geog.), a town of the Hirpini in Italy, at the foot of the Appenin, to the eaſt of Abellinum, contracted *Æclanum*, ſituate between Beneventum and Tarentum. The inhabitants are called *Æculani* by Pliny; and *Æclanenſes*, in an ancient inſcription, (Gruter). The town is now called *Fricenio*, Cluverius, 43 miles eaſt of Naples. E. Long. 15. 38. Lat. 41. 15.

ÆDES, in Roman antiquity, beſides its more ordinary ſignification of a houſe, likewiſe ſignified an inferior kind of temple, conſecrated to ſome deity.

ÆDICULA, a term uſed to denote the inner part of

of the temple, where the altar and ſtatue of the deity ſtood.

ÆDILATE, the office of ædile, ſometimes called *Ædility*. See the next article.

ÆDILE (*ædilis*), in Roman antiquity, a magiſtrate whoſe chief buſineſs was to ſuperintend buildings of all kinds, but more eſpecially public ones, as temples, aquæducts, bridges, &c. To the ædiles likewiſe belonged the care of the highways, public places, weights and meaſures, &c. They alſo fixed the prices of proviſions, took cognizance of debauches, puniſhed lewd women, and ſuch perſons as frequented gaming houſes. The cuſtody of the plebiſcita, or orders of the people, was likewiſe committed to them. They had the inſpection of comedies and other pieces of wit; and were obliged to exhibit magnificent games to the people, at their own expence, whereby many of them were ruined. To them alſo belonged the cuſtody of the plebiſcita, and the cenſure and examination of books. They had the power, on certain occaſions, of iſſuing edicts; and, by degrees, they procured to themſelves a conſiderable juriſdiction, the cognizance of various cauſes, &c. This office ruined numbers by its expenſiveneſs; ſo that, in Auguſtus's time, even many ſenators declined it on that account.

All theſe functions which rendered the ædiles ſo conſiderable belonged at firſt to the ædiles of the people, *ædiles plebeii*, or *minores*: theſe were only two in number, and were firſt created in the ſame year as the tribunes: for the tribunes, finding themſelves oppreſſed with the multiplicity of affairs, demanded of the ſenate to have officers, with whom they might intruſt matters of leſs importance; and accordingly two ædiles were created; and hence it was that the ædiles were elected every year at the ſame aſſembly as the tribunes. But theſe plebeian ædiles having refuſed, on a ſignal occaſion, to treat the people with ſhows, as pleading themſelves unable to ſupport the expence thereof, the patricians made an offer to do it, provided they would admit them to the honours of the *ædilate*. On this occaſion there were two new ædiles created, of the number of the patricians, in the year of Rome 388; they were called *ædiles curules*, or *majores*; as having a right to ſit on a curule chair, enriched with ivory, when they gave audience; whereas the plebeian ædiles only ſat on benches.—Beſides that the curule ædiles ſhared all the ordinary functions with the plebeian, their chief employ was, to procure the celebration of the grand Roman games, and to exhibit comedies, ſhews of gladiators, &c. to the people; and they were alſo appointed judges in all caſes relating to the ſelling or exchanging eſtates.

To eaſe theſe four firſt ædiles, Cæſar created a new kind, called *ædiles cereales*, as being deputed chiefly to take care of the corn, which was called *donum cereris*; for the Heathens honoured Ceres as the goddeſs who preſided over corn, and attributed to her the invention of agriculture. Theſe ædiles cereales were alſo taken out of the order of patricians. In the municipal cities there were ædiles, and with the ſame authority as at Rome.

We alſo read of an *ædiles alimentarius*, expreſſed in abbreviature by *Ædil. alim.* whoſe buſineſs ſeems to have been to provide diet for thoſe who were maintained at the public charge, though others aſſign him a different office.—In an ancient inſcription we alſo meet with *ædile* of the camp, *ædilis caſtrorum*

ÆDILITIUM EDICTUM, among the Romans, was that whereby a remedy was given a buyer, in caſe a vicious or unfound beaſt, or ſlave, was ſold him. It was called *ædilitium*, becauſe the preventing of frauds in ſales and contracts belonged eſpecially to the curule ædiles.

ÆDITUUS, in Roman antiquity, an officer belonging to the temple, who had the charge of the offerings, treaſure, and ſacred utenſils. The female deities had a woman officer of this kind called *Æditua*.

ÆGAGROPILA, a ball compoſed of a ſubſtance reſembling hair, generated in the ſtomach of the chamois-goat. This ball is of the ſame nature with thoſe found in cows, hogs, &c.

ÆGÆ, or ÆGÆA (anc. geog.), the name of *Edeſſa*, ſo called from the following adventure: Caranus, the firſt king of Macedonia, being ordered by the oracle to ſeek out a ſettlement in Macedonia, under the conduct of a flock of goats, ſurpriſed the town of Edeſſa, during a thick fog and rainy weather, in following the goats that fled from the rain; which goats ever after, in all his military expeditions, he cauſed to precede his ſtandard; and in memory of this he called Ædeſſa *Ægæa*, and his people *Ægæadæ*. And hence probably, in the prophet Daniel, the he-goat is the ſymbol of the king of Macedon.

ÆGEAN SEA (anc. geog.), now the *Archipelago*, a part of the Mediterranean, ſeparating Europe from Aſia and Africa; waſhing, on the one hand, Greece and Macedonia; on the other, Caria and Ionia. The origin of the name is greatly diſputed. Feſtus advances three opinions: one, that it is ſo called from the many iſlands therein, at a diſtance appearing like ſo many goats: another, becauſe Ægea queen of the Amazons periſhed in it: a third opinion is, becauſe Ægeus, the father of Theſeus, threw himſelf headlong into it.

ÆGEUS, in fabulous hiſtory, was king of Athens, and the father of Theſeus. The Athenians having baſely killed the ſon of Minos king of Crete, for carrying away the prize from them, Minos made war upon the Athenians; and being victorious, impoſed this ſevere condition on Ægeus, that he ſhould annually ſend into Crete ſeven of the nobleſt of the Athenian youths, choſen by lot, to be devoured by the Minotaur. On the fourth year of this tribute, the choice fell on Theſeus; or, as others ſay, he himſelf intreated to be ſent. The king, at his ſon's departure, gave orders, that as the ſhip ſailed with black ſails, it ſhould return with the ſame in caſe he periſhed; but, if he became victorious, he ſhould change them into white. When Theſeus returned to Crete, after killing the Minotaur, and forgot to change the ſails in token of his victory, according to the agreement with his father; the latter, who watched the return of the veſſel, ſuppoſing by the black ſails that his ſon was dead, caſt himſelf headlong into the ſea, which afterwards obtained the name of the *Ægean Sea*. The Athenians decreed Ægeus divine honours; and ſacrificed to him as a marine deity, the adopted ſon of Neptune.

ÆGIAS, among phyſicians, a white ſpeck on the pupil of the eye, which occaſions a dimneſs of ſight.

ÆGIDA, (Pliny); now *Capo d'Iſtria*, the principal

pal town on the north of the territory of Iſtria, ſituated in a little iſland, joined to the land by a bridge. In an inſcription, (Gruter), it is called *Ægidis Inſula*. E. Long. 14. 20. Lat. 45. 50. It was afterwards called *Juſtinopolis*, after the emperor Juſtinus.

ÆGILOPS, the name of a tumor in the great angle of the eye; either with, or without, an inflammation. The word is compounded of αιξ, *goat*, and ωψ, *eye*; as goats are ſuppoſed extremely liable to this diſtemper.

Authors frequently uſe the words *ægilops*, *anchilops*, and *fiſtula lachrymalis*, promiſcuouſly; but the more accurate, after Ægineta, make a difference.—The tumor, before it becomes ulcerous, is properly called *anchilops*; and, after it is got into the lachrymal paſſages, and has rendered the os lachrymale carious, *fiſtula lachrymalis*.

If the ægilops be accompanied with an inflammation, it is ſuppoſed to take its riſe from the abundance of blood which a plethoric habit diſcharges on the corner of the eye. If it be without an inflammation, it is ſuppoſed to proceed from a viſcous pituitous humour, thrown upon this part.

The method of cure is the ſame as that of the ophthalmia. But before it has reached the lachrymal paſſages, it is managed like other ulcers. If the ægilops be neglected, it burſts, and degenerates into a fiſtula, which eats into the bone.

ÆGILOPS, *Wild Feſtuc*; a genus of the monœcia order, belonging to the polygamia claſs of plants, and ranking under the 4th natural order, *Gramina*.—The characters are: The *hermaphrodite calyx* is a two-valved glume, triflorous; the corolla a two-valved glume, the exterior valvalet terminated by three ariſtæ or awns, the interior awnleſs: *Stamina*, three capillary filaments; ſtyle, two: *Seed*, one, oblong. *Male calyx* and *corolla*, each a glume as in the former; and *ſtamina*, the ſame number.—There are ſeven ſpecies, natives of Italy and ſome other parts of Europe; one of them, the incurvata, a native of Britain, grows by the ſea-ſhore, and is vulgarly called *ſea-hard-graſs*.

ÆGILOPS is alſo the trivial name of a ſpecies of QUERCUS.

ÆGIMURUS (anc. geog.), an iſland on the bay of Carthage, about 30 miles diſtant from that city, (Livy); now the *Galetta*: This iſland being afterwards ſunk in the ſea, two of its rocks remained above water, which were called *Aræ*, and mentioned by Virgil, becauſe the Romans and Carthaginians entered into an agreement or league to ſettle their mutual boundaries at theſe rocks.

ÆGINA, in fabulous hiſtory, the daughter of Æſopus, king of Bœotia, was beloved by Jupiter, who debauched her in the ſimilitude of a lambent flame, and then carried her from Epidaurus to a deſart iſland called *Oenope*, which afterwards obtained her own name.

ÆGINA (anc. geog.), an iſland on the Saronic Bay, or Bay of Engia, 20 miles diſtant from the Piræeus, formerly vying with Athens for naval power, and at the ſea-fight of Salamin diſputing the palm of victory with the Athenians. It was the country and kingdom of Æacus, who called it *Ægina* from his mother's name, it being before called *Oenopia*, (Ovid). The inhabitants were called *Æginetæ*, and *Æginenſes*. The Greeks had a common temple dedicated to Jupiter in Ægina. The Æginetæ applied to commerce; and were the firſt who coined money, called Νομισμα Αγιναιον: hence *Ægineticum æs*, formerly in great repute. The inhabitants were called *Myrmydones*, or a nation of ants, from their great application to agriculture. See ÆACUS.

This iſland was ſurrounded by Attica, the territory of Megara, and the Peloponneſus, each diſtant about 100 ſtadia, or 12 miles and a half. In circumference it was reckoned 180 ſtadia, or 22 miles and a half. It was waſhed on the eaſt and ſouth by the Myrtoan and Cretan ſeas.

It is now called *Eyina*, or *Egina*, the *g* ſoft and the *i* ſhort. The temple above-mentioned is ſituated upon the ſummit of a mountain called *Panhellenius*, about an hour diſtant from the ſhore. The Æginetans affirmed it was erected by ÆACUS; in whoſe time Hellas being terribly oppreſſed by drought, the Delphic oracle was conſulted; and the reſponſe was, That Jupiter muſt be rendered propitious by Æacus. The cities intreated him to be their mediator: He ſacrificed and prayed to Jupiter Panhellenius, and procured rain.

The temple was of the Doric order, and had ſix columns in front. Twenty-one of the exterior columns are yet ſtanding, with two in the front of the pronaos and of the poſticum, and five of the number which formed the ranges of the cell. The entablature, except the architrave, is fallen. The ſtone is of a light browniſh colour, much eaten in many places, and indicating a very great age. Some of the columns have been injured by boring to their centres for the metal. In ſeveral, the junction of the parts is ſo exact, that each ſeems to conſiſt of one piece. This ruin Mr Chandler conſiders as ſcarcely to be paralleled in its claim to a remote antiquity. The ſituation on a lonely mountain, at a diſtance from the ſea, has preſerved it from total demolition, amid all the changes and accidents of numerous centuries.

Near the ſhore is a burrow, raiſed, it is related, for Phocus, upon the following occaſion. Telamon and Peleus, ſons of Æacus, challenged their half-brother Phocus to contend in the Pentathlum. In throwing the ſtone, which ſerved as a quoit, Peleus hit Phocus, who was killed; when both of them fled. Afterwards, Telamon ſent a herald to aſſert his innocence. Æacus would not ſuffer him to land, or to apologize, except from the veſſel; or, if he choſe rather, from a heap caſt up in the water. Telamon, entering the private port by night, raiſed a barrow, as a token, it is likely, of a pious regard for the deceaſed. He was afterwards condemned, as not free from guilt; and ſailed away again to Salamis. The barrow in the ſecond century, when ſeen by Pauſanias, was ſurrounded with a fence, and had on it a rough ſtone. The terror of ſome dreadful judgment to be inflicted from heaven had preſerved it entire and unaltered to his time; and in a country depopulated and neglected, it may ſtill endure for many ages.

The ſoil of this iſland is, as deſcribed by Strabo, very ſtony, eſpecially the bottoms, but in ſome places not unfertile in grain. Beſides corn, it produces olives, grapes, and almonds; and abounds in pigeons and partridges. It has been related, that the Æginetans annually wage war with the feathered race, carefully

fully collecting or breaking their eggs, to prevent their multiplying, and in consequence a yearly famine. They have no hares, foxes, or wolves. The rivers in summer are all dry. The vaiwode or governor farms the revenue of the Grand Signior for 12 purses, or 6000 piastres. About half this sum is repaid yearly by the caratch-money, or poll-tax.

ÆGINA, the capital of the above island. Its site has been long forsaken. Instead of the temples mentioned by Pausanias, there are 13 lonely churches, all very mean; and two Doric columns supporting their architrave. These stand by the sea-side toward the low cape; and, it has been supposed, are a remnant of a temple of Venus, which was situated by the port principally frequented. The theatre, which is recorded as worth seeing, resembled that of the Epidaurians both in size and workmanship. It was not far from the private port; the stadium, which, like that at Priene, was constructed with only one side, being joined to it behind, and each structure mutually sustaining and propping the other. The walls belonging to the ports and arsenal were of excellent masonry, and may be traced to a considerable extent, above, or nearly even with, the water. At the entrance of the mole, on the left, is a small chapel of St Nicholas; and opposite, a square tower with steps before it, detached, from which a bridge was laid across, to be removed on any alarm. This structure, which is mean, was erected by the Venetians, while at war with the Turks in 1693.

ÆGINETA (Paulus), a celebrated surgeon of the island of Ægina, from whence he derived his name. According to Mr Le Clerc's calculation, he lived in the fourth century; but Abulpharagius the Arabian, who is allowed to give the best account of those times, places him with more probability in the seventh. His knowledge in surgery was very great, and his works are deservedly famous. Fabricius ab Aquapendente has thought fit to transcribe him in a great variety of places. Indeed the doctrine of Paulus Ægineta, together with that of Celsus and Albucasis, make up the whole text of this author. He is the first writer who takes notice of the cathartic quality of rhubarb; and, according to Dr Milward, is the first in all antiquity who deserves the title of a man-midwife.

ÆGINHARD, the celebrated secretary and supposed son-in-law of Charlemagne. He is said to have been carried through the snow on the shoulders of the affectionate and ingenious Imma, to prevent his being tracked from her apartments by the emperor her father: a story which the elegant pen of Addison has copied and embellished from an old German chronicle, and inserted in the 3d volume of the Spectator.—This happy lover (supposing the story to be true) seems to have possessed a heart not unworthy of so enchanting a mistress, and to have returned her affection with the most faithful attachment; for there is a letter of Æginhard's still extant, lamenting the death of his wife, which is written in the tenderest strain of connubial affliction;—it does not, however, express that this lady was the affectionate princess, and indeed some late critics have proved that Imma was not the daughter of Charlemagne.—But to return to our historian: He was a native of Germany, and educated by the munificence of his imperial master, of which he has left the most grateful testimony in his preface to the life of that monarch.

Æginhard, after the loss of his lamented wife, is supposed to have passed the remainder of his days in religious retirement, and to have died soon after the year 840. His life of Charlemagne, his annals from 741 to 889, and his letters, are all inserted in the 2d volume of Duchesne's Scriptores Francorum. But there is an improved edition of this valuable historian, with the annotations of Hermann Schmincke, in 4to, 1711.

ÆGIPAN, in heathen mythology, a denomination given to the god Pan, because he was represented with the horns, legs, feet, &c. of a goat.

ÆGIPHILA, Goat-friend; a genus of the monogynia order, belonging to the tetrandia class of plants; the characters of which are: The *calyx* is a single-leaved perianthium, bell-shap'd, four-tooth'd, loose, very short, and persistent: The *corolla* consists of one petal; the tubus cylindric, narrower and longer than the calyx; the border divided into four segments, flat and equal; the divisions oblong: The *stamina* consist of four erect capillary filaments; the antheræ are incumbent and squared: The *pistillum* has a germen above; a capillary, two-cleft, middle-sized stylus; and a simple stigma: The *pericarpium* is a roundish unilocular berry: The *seeds* are four. There is only one species, a native of Martinico.

ÆGIS, in the ancient mythology, a name given to the shield or buckler of Jupiter and Pallas.

The goat Amalthea, which had suckled Jove, being dead, that god is said to have covered his buckler with the skin thereof; whence the appellation *ægis*, from αιξ, αιγος, *she-goat*. Jupiter, afterwards restoring the beast to life again, covered it with a new skin, and placed it among the stars. As to his buckler, he made a present of it to Minerva; whence that goddess's buckler is also called *ægis*.

Minerva, having killed the Gorgon Medusa, nailed her head in the middle of the ægis, which henceforth had the faculty of converting into stone all those who looked thereon; as Medusa herself had done during her life.

Others take the ægis not to have been a buckler, but a cuirass, or breast-plate: and it is certain the ægis of Pallas, described by Virgil, Æn. lib. viii. ver. 435, must have been a cuirass; since that poet says expressly, that Medusa's head was on the breast of the goddess. But the ægis of Jupiter, mentioned a little higher, ver. 354, seems to have been a buckler: the words

Cum sæpe nigrantem
Ægida *concuteret dextra*,

agreeing very well to a buckler; but not at all to a cuirass or breast-plate.

Servius makes the same distinction on the two passages of Virgil: for on verse 354, he takes the ægis for the buckler of Jupiter, made, as above-mentioned, of the skin of the goat Amalthea; and on verse 435 he describes the ægis as the armour which covers the breast, and which in speaking of men is called *cuirass*, and *ægis* in speaking of the gods. Many authors have overlooked these distinctions for want of going to the sources.

ÆGISTHUS, in ancient history, was the son of Thyestes by his own daughter Pilopeia, who, to conceal her shame, exposed him in the woods: some say he was taken up by a shepherd, and suckled by a goat, whence he was called *Ægisthus*. He corrupted Cly-

Ægithallus || Ægospotamos.

temneſtra the wife of Agamemnon; and with her aſſiſtance ſlew her huſband, and reigned ſeven years in Mycenæ. He was, together with Clytemneſtra, ſlain by Oreſtes. Pompey uſed to call Julius Cæſar *Ægiſthus*, on account of his having corrupted his wife Mutia, whom he afterwards put away, though he had three children by her.

ÆGITHALLUS (anc. geog.), a promontory and citadel of Sicily, between Drepanum and the Emporium Aegiſtanum, afterwards called *Acellus;* corruptly written *Aegitharſos*, in Ptolemy; ſituate near mount Eryx, and now called *Capo di Santo Teodoro.*

ÆGIUM, (anc. geog.) a town of Achaia Propria, five miles from the place where Helice ſtood, and famous for the council of the Acheans, which uſually met there on account either of the dignity or commodious ſituation of the place. It was alſo famous for the worſhip of Ομαγυριος Ζευς, *Conventional Jupiter*, and of *Panachæan Ceres.* The territory of Ægium was watered by two rivers, viz. the Phœnix and Meganitas. The epithet is *Ægienſis.* There is a coin in the cabinet of the king of Pruſſia, with the inſcription ΑΙΓΙ, and the figure of a tortoiſe, which is the ſymbol of Peloponneſus, and leaves no doubt as to the place where it was ſtruck.

ÆGOBOLIUM, in antiquity, the facrifice of a goat offered to Cybele. The ægobolium was an expiatory facrifice, which bore a near reſemblance to the taurobolium and criobolium, and ſeems to have been ſometimes joined with them.

ÆGOPODIUM, small wild Angelica, Goutwort, Goatsfoot, Herb Gerard, or Ashweed; a genus of the digynia order, belonging to the pentandria claſs of plants; the characters of which are: The univerſal *calyx* is a manifold convex umbel; the partial one, conſimilar and flat; there is no involucrum; and the proper perianthium is ſcarcely diſcernible: The univerſal *corolla* is uniform, the florets all fertile; the proper one has five inverſe-ovate, concave, equal petals, inflected at the top: The *ſtamina* conſiſt of five ſimple filaments twice the length of the corolla; the antheræ roundiſh: The *piſtillum* has a germen beneath; two purple erect ſtyli the length of the corollet; the ſtigmata are headed: No *pericarpium:* The fruit is ovate, ſtriated, and bipartite: The *ſeeds* are two, ovate, on one ſide convex and ſtriated, and flat on the other. There is but one ſpecies, a native of Britain and other parts of Europe. It is very common under hedges and about gardens; the leaves reſemble thoſe of Angelica, and it carries ſmall white flowers. Its roots run ſo faſt, as to render it a very troubleſome weed.

ÆGOPRICON, a genus of the monœcia order, belonging to the diandria claſs of plants; the characters of which are: The *calyx* both of the male and female is a tubular perianthium of one leaf divided into three ſegments: *Corolla* wanting in both: The *ſtamina* conſiſt of a ſingle erect filament longer than the calyx, with an ovate anthera: The *piſtillum* has an ovate germen, three divaricated ſtyli, and ſimple perſiſtent ſtigmata: The *pericarpium* is a globular berry, three-grained within, and three-cell'd: The *ſeeds* are ſolitary, and angular on one ſide.—There is but one ſpecies, a native of Surinam.

ÆGOSPOTAMOS, (anc. geog.), a river in the Thracian Cherſoneſus, falling with a ſouth-eaſt courſe into the Helleſpont, to the north of Seſtos; alſo a town, ſtation, or road for ſhips, at its mouth. Here the Athenians, under Conon, through the fault of his colleague Iſocrates, received a ſignal overthrow from the Lacedemonians under Lyſander, which was followed by the taking of Athens, and put an end to the Peloponneſian war. The Athenian fleet having followed the Lacedemonians, anchored in the road, over againſt the enemy, who lay before Lampſacus. The Helleſpont is not above two thouſand paces broad in that place. The two armies ſeeing themſelves ſo near each other, expected only to reſt that day, and were in hopes of coming to a battle on the next.

Ægoſpotamos.

But Lyſander had another deſign in his view. He commanded the ſeamen and pilots to go on board their galleys, as if they were in reality to fight the next morning at break of day, to hold themſelves in readineſs, and to wait his orders with profound ſilence. He commanded the land-army in like manner to draw up in battle upon the coaſt, and to wait the day without noiſe. On the morrow, as ſoon as the ſun was riſen, the Athenians began to row towards them with their whole fleet in one line, and to bid them defiance. Lyſander, though his ſhips were ranged in order of battle, with their heads towards the enemy, lay ſtill without making any movement. In the evening, when the Athenians withdrew, he did not ſuffer his ſoldiers to go aſhore, till two or three galleys, which he had ſent out to obſerve them, were returned with advice that they had ſeen the enemy land. The next day paſſed in the ſame manner, as did the third and fourth. Such a conduct, which argued reſerve and apprehenſion, extremely augmented the ſecurity and boldneſs of the Athenians, and inſpired them with an extreme contempt for an army, which fear, in their ſenſe, prevented from ſhowing themſelves, and attempting any thing.

Whilſt this paſſed, Alcibiades, who was near the fleet, took horſe, and came to the Athenian generals; to whom he repreſented, that they kept upon a very diſadvantageous coaſt, where there were neither ports nor cities in the neighbourhood; that they were obliged to bring their proviſions from Ceſtos with great danger and difficulty; and that they were very much in the wrong to ſuffer the ſoldiers and mariners of the fleet, as ſoon as they were aſhore, to ſtraggle and diſperſe themſelves at their own pleaſure, whilſt they were faced in view by the enemy's fleet, accuſtomed to execute the orders of their general with the readieſt obedience, and upon the ſlighteſt ſignal. He offered alſo to attack the enemy by land with a ſtrong body of Thracian troops, and to force them to a battle. The generals, eſpecially Tydeus and Menander, jealous of their command, did not content themſelves with refuſing his offers, from the opinion, that if the event proved unfortunate, the whole blame would fall on them, and if favourable, that Alcibiades alone would have the honour of it; but rejected alſo with inſult his wiſe and ſalutary counſel, as if a man in diſgrace loſt his ſenſe and abilities with the favour of the common-wealth. Alcibiades withdrew.

The fifth day the Athenians preſented themſelves again, and offered battle; retiring in the evening according to cuſtom with more inſulting airs than the days before. Lyſander, as uſual, detached ſome galleys to obſerve them, with orders to return with the utmoſt

utmoſt diligence when they ſaw the Athenians landed, and to put up a brazen buckler at each ſhip's head as ſoon as they reached the middle of the channel. Himſelf in the mean time ran through the whole line in his galley, exhorting the pilots and officers to hold the ſeamen and ſoldiers in readineſs to row and fight on the firſt ſignal.

As ſoon as the bucklers were put up in the ſhips heads, and the admiral galley had given the ſignal by the ſound of trumpet, the whole fleet ſet forward in good order. The land-army at the ſame time made all poſſible haſte to the top of the promontary to ſee the battle. The ſtrait that ſeparates the two continents in this place is about fifteen ſtadia, or three quarters of a league in breadth; which ſpace was preſently cleared through the activity and diligence of the rowers. Conon the Athenian general was the firſt who perceived from ſhore, that fleet advance in good order to attack him; upon which he immediately cried out for the troops to embark. In the height of ſorrow and trouble, ſome he called to by their names, ſome he conjured, and others he forced to go on board their galleys; but all his endeavours and emotion were ineffectual, the ſoldiers being diſperſed on all ſides. For they were no ſooner come on ſhore, than ſome run to the ſutlers, ſome to walk in the country, ſome to ſleep in their tents, and others had begun to dreſs their ſuppers. This proceeded from the want of vigilance and experience in their generals, who, not ſuſpecting the leaſt danger, indulged themſelves in their taking repoſe, and gave their ſoldiers the ſame liberty.

The enemy had already fallen on with loud cries and a great noiſe of their oars, when Conon, diſengaging himſelf with nine galleys, of which number was the ſacred ſhip called the *Paralian*, ſtood away for Cyprus, where he took refuge with Evagoras. The Peloponneſians, falling upon the reſt of the fleet, took immediately the galleys which were empty, and diſabled and deſtroyed ſuch as began to fill with men. The ſoldiers, who ran without order or arms to their relief, were either killed in the endeavour to get on board, or flying on ſhore were cut to pieces by the enemy, who landed in purſuit of them. Lyſander took 3000 priſoners, with all the generals, and the whole fleet. After having plundered the camp, and faſtened the enemy's galleys to the ſterns of his own, he returned to Lampſacus amidſt the ſound of flutes and ſongs of triumph. It was his glory to have atchieved one of the greateſt military exploits recorded in hiſtory with little or no loſs, and to have terminated a war in the ſmall ſpace of an hour, which had already laſted 27 years, and which, perhaps, without him, had been of much longer continuance.

ÆGYPT. See Egypt.

ÆGYPTIACUM, in pharmacy, the name of ſeveral detergent ointments; which are deſcribed under the article Ointment.

ÆGYPTILLA, in natural hiſtory, the name of a ſtone deſcribed by the ancients, and ſaid, by ſome authors, to have the remarkable quality of giving water the colour and taſte of wine. This ſeems a very imaginary virtue, as are indeed too many of thoſe in former ages attributed to ſtones. The deſcriptions left us of this remarkable foſſil tell us, that it was variegated with, or compoſed of, veins of black and white, or black and blueiſh, with ſometimes a plate or vein of whitiſh red. The authors of theſe accounts ſeem to have underſtood by this name the ſeveral ſtones of the onyx, ſardonyx, and camæa kind; all which we have at preſent common among us, but none of which poſſeſs any ſuch ſtrange properties.

ÆGYPTUS, (fab. hiſt.) was the ſon of Belus, and brother of Danaus. See Belides.

ÆINATÆ, in antiquity, a denomination given to the ſenators of Miletus, becauſe they held their deliberations on board a ſhip, and never returned to land till matters had been agreed on.

ÆLIAN (Claudius), born at Præneſte in Italy. He taught rhetoric at Rome, according to Perizonius, under the emperor Alexander Severus. He was ſirnamed Μελιγλωσσος, *Honey-mouth*, on account of the ſweetneſs of his ſtyle. He was likewiſe honoured with the title of Sophiſt, an appellation in his days given only to men of learning and wiſdom. He loved retirement, and devoted himſelf to ſtudy. He greatly admired and ſtudied Plato, Ariſtotle, Iſocrates, Plutarch, Homer, Anacreon, Archilochus, &c. and, though a Roman, gives the preference to the writers of the Greek nation. His two moſt celebrated works are, his Various Hiſtory, and Hiſtory of Animals. He compoſed likewiſe a book on Providence, mentioned by Euſtathius; and another on Divine Appearances, or The Declarations of Providence. There have been ſeveral editions of his Various Hiſtory.

ÆLI PONS (anc. geog.), one of the fortreſſes near the wall or rampart, or, in the words of the Notitia, through the line of the hither wall; built, as is thought, by Adrian*. Now Porteland, (Camden), in Northumberland, between Newcaſtle and Morpeth. * See *Adrian* (emperor.)

ÆLIUS PONS, now *il Ponte S. Angelo*, a ſtone-bridge at Rome, over the Tyber, which leads to the Burgo and Vatican from the city, along Adrian's mole, built by the emperor Adrian.

ÆLFRED. See Alfred.

ÆLURUS, in Egyptian mythology, the deity or god of cats; repreſented ſometimes like a cat, and ſometimes like a man with a cat's head. The Egyptians had ſo ſuperſtitious a regard for this animal, that the killing it, whether by accident or deſign, was puniſhed with death: and Diodorus relates, that, in the time of extreme famine, they choſe rather to eat one another than touch theſe ſacred animals.

AEM, Am, or Ame, a liquid meaſure uſed in moſt parts of Germany; but different in different towns; the aem commonly contains 20 vertils, or 80 maſſes; that of Heidelbergh is equal to 48 maſſes; and that of Wirtembergh to 160 maſſes. See Aam.

ÆMILIUS (Paulus), the ſon of Lucius Paulus, who was killed at the battle of Cannæ, was twice conſul. In his firſt conſulate he triumphed over the Ligurians; and in the ſecond ſubdued Perſeus king of Macedonia, and reduced that country to a Roman province, on which he obtained the ſurname of Macedonicus. He returned to Rome loaded with glory, and triumphed for three days. He died 168 years before Chriſt.

Æmilius (Paulus), a celebrated hiſtorian, born at Verona, who obtained ſuch reputation in Italy, that he was invited into France by the cardinal of Bourbon, in

Æmoboli-um || Æneid. the reign of Lewis XII. in order to write the history of the kings of France in Latin, and was given a canonry in the cathedral of Paris. He was near 30 years in writing that history, which has been greatly admired; and died at Paris on the 5th of May 1529.

ÆMOBOLIUM, in antiquity, the blood of a bull or ram offered in the sacrifices, called *taurobolia* and *criobolia*; in which sense the word occurs in ancient inscriptions.

ÆNARIA (anc. geog.), an island on the bay of Cumæ, or over-against Cumæ in Italy, (Pliny.) It is also called *Inarime*, (Virgil); and now *Ischia*: scarce three miles distant from the coast, and the promontory Misenus to the west; 20 miles in compass; called *Pithecusa* by the Greeks. It is one of the Oenotrides, and fenced round by very high rocks, so as to be inaccessible but on one side; it was formerly famous for its earthen ware. See ISCHIA.

ÆNEAS (fab. hist.), a famous Trojan prince, the son of Anchises and Venus. At the destruction of Troy, he bore his aged father on his back, and saved him from the Greeks; but being too solicitous about his son and household-gods, lost his wife Creusa in the escape. Landing in Africa, he was kindly received by queen Dido: but quitting her coast, he arrived in Italy, where he married Lavinia the daughter of king Latinus, and defeated Turnus, to whom she had been contracted. After the death of his father-in-law, he was made king of the Latins, over whom he reigned three years: but joining with the Aborigines, he was slain in a battle against the Tuscans. Virgil has rendered the name of this prince immortal, by making him the hero of his poem. See ÆNEID.

ÆNEAS SYLVIUS, (Pope). See PIUS II.

ÆNEATORES, in antiquity, the musicians in an army, including those who played trumpets, horns, &c. The word is formed from *æneus*, on account of the brazen instruments used by them.

ÆNEID, the name of Virgil's celebrated epic poem. The subject of the Æneid, which is the establishment of Æneas in Italy, is extremely happy. Nothing could be more interesting to the Romans than to look back to their origin from so famous a hero. While the object was splendid itself, the traditionary history of his country opened interesting fields to the poet; and he could glance at all the future great exploits of the Romans, in its ancient and fabulous state.

Blair's Lectures.

As to the unity of action, it is perfectly well preserved in the Æneid. The settlement of Æneas, by the order of the gods, is constantly kept in view. The episodes are linked properly with the main subject. The nodus, or intrigue of the poem, is happily managed. The wrath of Juno, who opposes Æneas, gives rise to all his difficulties, and connects the human with the celestial operations throughout the whole poem.

One great imperfection of the Æneid, however, is, that there are almost no marked characters in it. Achates, Cloanthes, Gyas, and other Trojan heroes who accompanied Æneas into Italy, are insipid figures. Even Æneas himself is without interest. The character of Dido is the best supported in the whole Æneid.

The principal excellency of Virgil is tenderness. His soul was full of sensibility. He must have felt himself all the affecting circumstances in the scenes he describes; and he knew how to touch the heart by a single stroke. In an epic poem this merit is the next to sublimity. The second book of the Æneid is one of the greatest master-pieces that ever was executed. The death of old Priam, and the family-pieces of Æneas, Anchises, and Creusa, are as tender as can be conceived. In the fourth book, the unhappy passion and death of Dido are admirable. The episodes of Pallas and Evander, of Nisus and Euryalus, of Lausus and Mezentius, are all superlatively fine.

Ængina, Ænigma.

In his battles, Virgil is far inferior to Homer. But in the important episode, the descent into hell, he has outdone Homer by many degrees. There is nothing in antiquity to equal the sixth book of the Æneid.

ÆNGINA, one of the islands of the Archipelago. It lies in the bay of Engia, and the town of that name contains about 800 houses and a castle; and near it are the ruins of a magnificent structure, which was probably a temple.

ÆNIGMA, denotes any dark saying, wherein some well-known thing is concealed under obscure language. The word is Greek, Αινιγμα, formed of αινιττεσθαι, *obscure innuere*, to hint a thing darkly, and of αινος, an obscure speech or discourse. The popular name is *riddle*; from the Belgic *raeden*, or the Saxon *araethan*, to interpret. Fa. Bouhours, in the memoirs of Trevoux, defines an ænigma, A discourse, or painting, including some hidden meaning, which is proposed to be guessed.

Painted ÆNIGMAS, are representations of the works of nature, or art, concealed under human figures, drawn from history, or fable.

A Verbal ÆNIGMA, is a witty, artful, and abstruse description of any thing.—In a general sense, every dark saying, every difficult question, every parable, may pass for an *ænigma*. Hence obscure laws are called *Ænigmata Juris*. The alchemists are great dealers in the ænigmatic language, their processes for the philosophers stone being generally wrapped up in riddles: e. g. *Fac ex mare et fæmina circulum, inde quadrangulum, hinc triangulum, fac circulum, et habebis lapidem philosophorum.*—F. Menestrier has attempted to reduce the composition and resolution of ænigmas to a kind of art, with fixed rules and principles, which he calls the philosophy of *ænigmatic* images.

The Subject of an ÆNIGMA, or the thing to be concealed and made a mystery of, he justly observes, ought not to be such in itself; but, on the contrary, common, obvious, and easy to be conceived. It is to be taken, either from nature, as the heavens, or stars; or from art, as painting, the compass, a mirror, or the like.

The Form of ÆNIGMAS consists in the words, which, whether they be in prose or verse, contain either some description, a question, or a prosopopæia. The last kind are the most pleasing, inasmuch as they give life and action to things which otherwise have them not. To make an ænigma, therefore, two things are to be pitched on, which bear some resemblance to each other; as the sun and a monarch; or a ship and a house: and on this resemblance is to be raised a superstructure of contrarieties to amuse and perplex. It is easier to find great subjects for ænigmas in figures than in words, inasmuch as painting attracts the eyes and excites the attention to discover the sense. The subjects of enigmas in painting, are to be taken either from history or fable: the composition here is a kind of metamorphosis,

Ænigma. tamorphosis, wherein, e. g. human figures are changed into trees, and rivers into metals. It is essential to ænigmas, that the history or fable, under which they are presented, be known to every body; otherwise it will be two ænigmas instead of one; the first of the history or fable, the second of the sense in which it is to be taken. Another essential rule of the ænigma is, that it only admit of one sense. Every ænigma which is susceptive of different interpretations, all equally natural, is so far imperfect. What gives a kind of erudition to an ænigma, is the invention of figures in situations, gestures, colours, &c. authorised by passages of the poets, the customs of artists in statues, basso relievos, inscriptions, and medals.—In foreign colleges,

The Explication of ÆNIGMAS makes a considerable exercise; and that one of the most difficult and amusing, where wit and penetration have the largest field. —By explaining an ænigma, is meant the finding a motto corresponding to the action and persons represented in a picture, taken either from history or mythology. The great art of this exercise consists in the choice of a motto, which either by itself, or the circumstances of time, place, person who speaks, or those before whom he is speaking, may divert the spectators, and furnish occasion for strokes of wit; also in showing to advantage the conformities between the figure and thing figured, giving ingenious turns to the reasons employed to support what is advanced, and in artfully introducing pieces of poetry to illustrate the subject and awaken the attention of the audience.

As to the solution of ænigmas, it may be observed, that those expressed by figures are more difficult to explain than those consisting of words, by reason images may signify more things than words can; so that to fix them to a particular sense, we must apply every situation, symbol, &c. and without omitting a circumstance.—As there are few persons in history, or mythology, but have some particular character of vice or virtue, we are, before all things, to attend to this *character*, in order to divine what the figure of a person represented in a painting signifies, and to find what agreement this may have with the subject whereof we would explain it. Thus, if Proteus be represented in a picture, it may be taken to denote *inconstancy*, and applied either to a physical or moral subject, whose character is to be changeable; e. g. an almanack, which expresses the weather, the seasons, heat, cold, storms, and the like. The *colours* of figures may also help to unriddle what they mean: *white*, for instance, is a mark of innocence, *red* of modesty, *green* of hope, *black* of sorrow, &c. When figures are accompanied with *symbols*, they are less precarious; these being, as it were, the soul of ænigmas, and the key that opens the mystery of them. Of all the kinds of symbols which may be met with in those who have treated professedly on the subject, the only truly ænigmatical are those of Pythagoras, which, under dark proverbs, hold forth lessons of morality; as when he says, *Stateram ne transilias*, to signify, Do no injustice.

But it must be added, that we meet with some ænigmas in history, complicated to a degree, which much transcends all rules, and has given great perplexity to the interpreters of them. Such is that celebrated ancient one, *Ælia Lælia Crispis*, about which many of the learned have puzzled their heads. There are two exemplars of it: one found 140 years ago, on a marble near Bolognia: the other in an ancient MS. written in Gothic letters, at Milan. It is controverted between the two cities, which is to be reputed the more authentic.

The Bononian *Ænigma.*

D. M.
Ælia Lælia Crispis,
Nec vir, nec mulier,
Nec androgyna;
Nec puella, nec juvenis,
Nec anus;
Nec casta, nec meretrix,
Nec pudica;
Sed omnia:
Sublata
Neque fame, neque ferro,
Neque veneno;
Sed omnibus:
Nec cœlo, nec terris,
Nec aquis,
Sed ubique jacet.
Lucius Agatho Priscius,
Nec maritus, nec amator,
Nec necessarius;
Neque mærens, neque gaudens,
Neque flens;
Hanc,
Nec molem, nec pyramidem,
Nec sepulchrum,
Sed omnia,
Scit et nescit, cui posuerit.

That is to say, *To the gods manes, Ælia Lælia Crispis, neither man, nor woman, nor hermaphrodite; neither girl, nor young woman, nor old; neither chaste, nor a whore; but all these: killed neither by hunger, nor steel, nor poison; but by all these: rests neither in heaven, nor on earth, nor in the waters; but every where. Lucius Agatho Priscius, neither her husband, nor lover, nor friend; neither sorrowful, nor joyful, nor weeping, certain, or uncertain, to whom he rears this monument, neither erects her a temple, nor a pyramid, nor a tomb, but all these.* In the MS. at Milan, instead of *D. M.* we find *A. M. P. P. D.* and at the end the following addition:

Hoc est sepulchrum intus cadaver non habens,
Hoc est cadaver sepulchrum extra non habens,
Sed cadaver idem est et sepulchrum.

We find near 50 several solutions of this ænigma advanced by learned men. Marius Michael Angelus maintains *Ælia Lælia Crispis* to signify rain-water falling into the sea. Ri. Vitus first explained it of Niobe turned to a stone, afterwards of the rational soul, and afterwards of the Platonic idea; Jo. Turrius, of the *materia prima*; Fr. Schottus, of an eunuch; Nic. Bernardus, of the philosophers-stone, in which he is followed by Borrichius; Zach. Pontinus, of three human bodies in the same situation, and buried by three different men at the same time; Nesmondius, of a law-suit; Jo. Gas. Gerartius, of love; Zu. Boxhornius, of a shadow; P. Terronus, of music; Fort Licetus, of generation, friendship, and privation: M. Ov. Montalbanus, of hemp; Car. Cæs. Malvasia, of an abortive girl promised in marriage; Pet. Mengulus, of the rule of chastity, prescribed by the founder of the military

military religion of St Mary; M. de Ciconia, of pope Joan; Heumannus, of Lot's wife; and laſtly, J. C. S. an anonymous writer in the Leipſic Acts, of the Chriſtian church.

ÆNIGMATOGRAPHY, or ÆNIGMATHOLOGY, the art of reſolving or making ænigmas.

ÆNONA (anc. geog.), a city of Liburnia, called by Pliny *Civitas Praſini*, the reaſon of which is unknown; alſo *Enona*, and is now called *Nona;* on the Adriatic, by which it is for the greater part ſurrounded; over-againſt the iſland Giſſa, from which it is diſtant four miles to the weſt. E. Long. 16°, Lat. 28°.

ÆNUS (anc. geog.), now the *Inn*, a river of Germany, which, riſing in the country of the Griſons, out of the Alps, in the diſtrict called Gottes-haus-punt, runs through the Griſons, the county of Tyrol, the duchy of Bavaria, and through Paſſau into the Danube.

ÆNUS, *Ænos*, or *Ænum* (anc. geog.), a town of Thrace, ſituate on the eaſt-moſt mouth of the Hebrus, which has two mouths; and ſaid to be built by the Cumeans. It was a free town, in which ſtood the tomb of Polydorus, (Pliny); *Ænius* is the epithet. Here the brother of Cato Uticenſis died, and was honoured with a monument of marble in the forum of the Ænii, (Plutarch); called *Ænei*, (Stephanus); Livy ſays that the town was otherwiſe called *Abſynthus*. Now *Eno*.

ÆNITHOLOGIUS, in poetry, a verſe of two dactyls and three trochæi; as, *Prælia dira placent truci juventæ.*

ÆOLIÆ INSULÆ, now *Iſole di Lipari*, (anc. geog.), ſeven iſlands, ſituated between Sicily and Italy, ſo called from Æolus, who reigned there about the time of the Trojan war. The Greeks call them *Hephæſtiades;* and the Romans *Vulcaniæ*, from their fiery eruptions. They are alſo called *Liparæorum Inſulæ*, from ther principal iſland Lipara. Dionſius Periegetes calls them Πλωταὶ, becauſe circumnavigable.

ÆOLIC, in a general ſenſe, denotes ſomething belonging to Æolis.

ÆOLIC, or ÆOLIAN, in grammar, denotes one of the five dialects of the Greek tongue. It was firſt uſed in Bœotia; whence it paſſed into Æolia, and was that which Sappho and Alcæus wrote in. The Æolic dialect generally throws out the aſpirate or ſharp ſpirit, and agrees in ſo many things with the DORIC dialect, that the two are uſually confounded together.

The *Æolic digama* is a name given to the letter F, which the Æolians uſed to prefix to words beginning with vowels, as Ϝοινος, for οινος; alſo to inſert between vowels, as οϜις, for οις.

ÆOLIC Verſe, in proſody, a verſe conſiſting of an iambus, or ſpondee; then of two anapeſts, ſeparated by a long ſyllable; and, laſtly, of another ſyllable. Such as, *O ſtelliferi conditor orbis.* This is otherwiſe called *eulogic* verſe; and, from the chief poets who uſed it, *Archilochian* and *Pindaric*.

ÆOLIPILE, in hydraulics, is a hollow ball of metal, generally uſed in courſes of experimental philoſophy, in order to demonſtrate the poſſibility of converting water into an elaſtic ſteam or vapour by heat. The inſtrument, therefore, conſiſts of a ſlender neck, or pipe, having a narrow orifice inſerted into the ball by means of a ſhouldered ſcrew. This pipe being taken out, the ball is filled almoſt full of water, and the pipe

being again ſcrewed in, the ball is placed on a pan of kindled charcoal, where it is well heated, and there iſſues from the orifice a vapour, with prodigious violence and great noiſe, which continues till all the included water is diſcharged. The ſtronger the fire is, the more elaſtic and violent will be the ſteam; but care muſt be taken that the ſmall orifice of the pipe be not, by any accident, ſtopped up; becauſe the inſtrument would in that caſe infallibly burſt in pieces, with ſuch violence as may greatly endanger the lives of the perſons near it. Another way of introducing the water is to heat the ball red-hot when empty, which will drive out almoſt all the air; and then by ſuddenly immerging it in water, the preſſure of the atmoſphere will force in the fluid, till it is nearly full. Des Cartes and others have uſed this inſtrument to account for the natural cauſe and generation of the wind: and hence it was called *Æolopila:* q. d. *pila Æoli*, the ball of Æolus or of the god of the winds.

ÆOLIS, or ÆOLIA (anc. geog.), a country of the Hither Aſia, ſettled by colonies of Æolian Greeks. Taken at large, it comprehends all Troas, and the coaſt of the Helleſpont to the Propontis, becauſe in thoſe parts there were ſeveral Æolian colonies: more ſtrictly, it is ſituated between Troas to the north, and Ionia to the ſouth. The people are called *Æoles*, or *Æolii*.

ÆOLIUM MARE (anc. geog.), a part of the Egean ſea, waſhing Æolis; called alſo *Myſium*, from Myſia. Now called, *Golfo di Smyrna*.

ÆOLUS, in heathen mythology, the god of the winds, was ſaid to be the ſon of Jupiter by Acaſta, or Sigeſia, the daughter of Hippotus; or, according to others, the ſon of Hippotus by Menæclea, daughter of Hyllus king of Lipara. He dwelt in the iſland Strongyle, now called *Strombolo*, one of the ſeven iſlands called *Æolian* from their being under the dominion of Æolus. Others ſay, that his reſidence was at Regium, in Italy; and others again place him in the iſland Lipara. He is repreſented as having authority over the winds, which he held enchained in a vaſt cavern, to prevent their continuing the devaſtations they had been guilty of before they were put under his direction. Mythologiſts explain the original of theſe fables, by ſaying, that he was a wiſe and good prince; and, being ſkilled in aſtronomy, was able, by the flux and reflux of the tides, and the nature of the volcano in the iſland Strongyle, to foretel ſtorms and tempeſts.

Harp of ÆOLUS, or the Æolian lyre. See ACOUSTICS, n° 10.

ÆON, a Greek word, properly ſignifying the age or duration of any thing.

ÆON, among the followers of Plato, was uſed to ſignify any virtue, attribute, or perfection: hence they repreſented the deity as an aſſemblage of all poſſible æons; and called him *pleroma*, a Greek term ſignifying *fullneſs*. The Valentinians, who, in the firſt ages of the church, blended the conceits of the Jewiſh cabaliſts, the Platoniſts, and the Chaldean philoſophers, with the ſimplicity of the Chriſtian doctrine, invented a kind of Theogony, or Genealogy of Gods (not unlike that of Heſiod), whom they called by ſeveral glorious names, and all by the general appellation of ÆONS: among which they reckoned Ζων, *Life;* Λογος, *Word;* Μονογενης, *Only-begotten;* Πληρωμα, *Fullneſs;* and many other divine powers and emanations, amounting

in number to thirty: which they fancied to be fucceffively derived from one another; and all from one felf-originated deity, named *Bythus*, i. e. *profound* or *unfathomable;* whom they called likewife, *The moft high and ineffable Father*. See VALENTINIANS.

ÆORA, among ancient writers on medicine, is ufed for geftation; which fort of exercife was often prefcribed by the phyficians of thofe days. Other exercifes confifted principally in the motion of the body; but in the *æora* the limbs were at reft, while the body was carried about and moved from place to place, in fuch a manner as the phyfician prefcribed. It had therefore the advantages of exercife, without the fatigue of it.—This exercife was promoted feveral ways: fometimes the patient was laid in a fort of hammoc, fupported by ropes, and moved backward and forward; fometimes his bed run nimbly on its feet. And befide thefe, the feveral ways of travelling were accounted fpecies of the *æora*, whether in the litter, in a boat or fhip, or on even ground in a chariot.—Afclepiades was the firft who brought geftation into practice, which was ufed as a means to recover ftrength after a fever, &c.

ÆQUANA JUGA, (anc. geog.); mountains of Picenum, in the kingdom of Naples, now called *Montagna di Sorrento*, denominated from the town Æqua, which being deftroyed, was replaced by Vicus, now *Vico di Sorrento;* called alfo *Æquana*, Sil. Italicus.

ÆQUIMELIUM, in antiquity, a place in Rome, where ftood the houfe of Spurius Melius, who, by largeffes corrupting the people, affected the fupreme power: refufing to appear before the dictator Cincinnatus, he was flain by Servilius Ahala, mafter of the horfe; his houfe was razed to the ground; and the fpot on which it ftood was called *Area Equimelii*. (Livy).

ÆRA, in chronology, a fixed point of time from whence any number of years is begun to be counted.

It is fometimes alfo written in ancient authors *Era*. The origin of the term is contefted, though it is generally allowed to have had its rife in Spain. Sepulveda fuppofes it formed from A. ER. A. the notæ or abbreviatures of the words, *annus erat Augufti*, occafioned by the Spaniards beginning their computation from the time their country came under the dominion of Auguftus, or that of receiving the Roman calendar. This opinion, however ingenious, is rejected by Scaliger, not only on account that in the ancient abbreviatures *A* never ftood for *annus*, unlefs when preceded by *V* for *vixit;* and that it feems improbable they fhould put ER for *erat*, and the letter A, without any difcrimination, both for *annus* and *Auguftus*. Voffius neverthelefs favours the conjecture, and judges it at leaft as probable, as either that of Ifidore, who derives *æra* from *æs*, the "tribute-money," wherewith Auguftus taxed the world: or that of Scaliger himfelf, who deduces it likewife from *æs*, though in a different manner. *Æs*, he obferves, was ufed among the ancients for an *article* or *item* in an account; and hence it came alfo to ftand for a fum or number itfelf. From the plural *æra*, came by corruption *æra*, *æram*, in the fingular; much as *Oftia*, *Oftiam*, the name of a place, from *Oftia*, the mouths of the Tyber.

The difference between the terms *æra* and *epoch* is, that the æras are certain points fixed by fome people, or nation; and the epochs are points fixed by chronologifts and hiftorians. The idea of an æra comprehends alfo a certain fucceffion of years proceeding from a fixed point of time, and the epoch is that point itfelf. Thus the Chriftian æra began at the epoch of the birth of Jefus Chrift. See CHRONOLOGY, where the different Æras, &c. are enumerated and explained.

ÆRARIUM, the treafury or place where the public money was depofited amongft the Romans.

ÆRARIUM *Sanctius* contained the monies arifing from the twentieth part of all legacies: this was kept for the extreme neceffities of the ftate.

ÆRARIUM *Privatum* was the emperor's privy purfe, or the place where the money arifing from his private patrimony was depofited.

ÆRARIUM *Vicefimarum*, the place where the money arifing from the taxes levied from foreign countries was laid up, fo called becaufe it moft commonly confifted of a twentieth part of the produce.

ÆRARIUM *Ilithyæ*, or *Junonis Lucinæ*, was where the monies were depofited which parents paid for the birth of each child.

There are feveral other treafuries mentioned in hiftory, as the *ærarium Juventutis*, *Veneris*, &c. The temple of Saturn was the public treafury of Rome, either becaufe Saturn firft taught the Italians to coin money, or, which is moft likely, becaufe this temple was the ftrongeft and moft fecure, and therefore the fitteft place for that purpofe.

Ærarium differs from *fifcus*, as the firft contained the public money, the fecond that of the prince. The two are, however, fometimes indifcriminately ufed for each other.

ÆRARIUS, a name given by the Romans to a degraded citizen, who had been ftruck off the lift of his century. Such perfons were fo called becaufe they were liable to all the taxes (*æra*), without enjoying any of its privileges.

The *ærarii* were incapable of making a will, of inheriting, of voting in affemblies, of enjoying any poft of honour or profit; in effect, were only fubject to the burdens, without the benefits of fociety; yet they retained their freedom, and were not reduced to the condition of flaves. To be made an *ærarius* was a punifhment inflicted for fome offence, and reputed one degree more fevere than to be expelled a tribe, *tribu moveri*.

ÆRARIUS was alfo an officer inftituted by Alexander Severus, for the diftribution of the money given in largeffes to the foldiery, or people.

ÆRARIUS was alfo ufed for a perfon employed in coining or working brafs.

Thefe are fometimes called *ærarii fufores:* at other times, *ærarius* is diftinguifhed from *fufor;* the former anfwering to what we now call copper-fmiths, the latter to founders.

ÆRARIUS was likewife applied to a foldier who receives pay.

AERIA, or EERIA (anc. geog.), the ancient name of Egypt: the fcholiaft on Apollonius Rhodius, fays, that not only Theffaly, but Egypt, was called Ἠερία by the Greeks, which Eufebius alfo confirms: and hence Apollinarius, in his tranflation of the 114th Pfalm, ufes it for Egypt. Hefychius applies this name to Ethiopia.

AERIAL.

Aerial, Aerians.

AERIAL, in a general ſenſe, denotes ſomething partaking of the nature of air; thus, aërial ſubſtance, aërial particles, &c.

Aerial Perſpective. See Perspective and Painting.

AERIANS, in church-hiſtory, a branch of Arians, who, to the doctrines of that ſect, added ſome peculiar dogmas of their own; as, that there is no difference between biſhops and prieſts; a doctrine maintained by many modern divines, particularly of the preſbyterian and reformed churches. The ſect received its denomination from Aerius an Armenian prieſt of the fourth century. He founded his doctrine chiefly upon ſome paſſages in St Paul; and, among others, upon that in 1 Tim. iv. 14. where the apoſtle exhorts him not to neglect *the gift he had received by the laying on of the hands of the Preſbytery.* Here, obſerves Aerius, are no mention of biſhops: on the contrary, Timothy evidently received his ordination from the preſbyters or prieſts.—Epiphanius zealouſly maintains the ſuperiority of biſhops againſt the Aerians. The word *preſbytery*, uſed by the apoſtle, he obſerves, includes both biſhops and prieſts; the whole ſenate or aſſembly of the eccleſiaſtics of the place.

Flos Æris, Aerography.

Flos Æris, among alchemiſts, ſmall ſcales procured from copper melted by a ſtrong heat; it is ſometimes uſed for ærugo or verdigriſe.

AEROGRAPHY, from αηρ, *air*, and γραφω, *I deſcribe;* a deſcription of the air, or atmoſphere, its limits, dimenſions, properties, &c.—This amounts to much the ſame with aerology, unleſs we ſuppoſe the latter to enter into the rational, and the former to confine itſelf to a deſcription of the more obvious affections thereof. See Atmosphere.

AEROLOGY,

The doctrine or ſcience of Air, its nature and different ſpecies, with their ingredients, properties, phenomena, and uſes.

Air, in a general ſenſe, is that inviſible fluid everywhere ſurrounding this globe; on which depends not only animal but vegetable life; and which ſeems, in ſhort, to be one of the great agents employed by nature in carrying on her operations throughout the world.

Though the attention of philoſophers has in all ages been engaged in ſome meaſure by inquiries concerning the nature of the atmoſphere, yet till within theſe laſt 30 years, little more than the mere mechanical action of this fluid was diſcovered, with the exiſtence of ſome anomalous and permanently elaſtic vapours, whoſe properties and relation to the air we breathe were almoſt entirely unknown. Within the above-mentioned period, however, the diſcoveries concerning the conſtituent parts of the atmoſphere itſelf, as well as the nature of the different permanently elaſtic fluids which go under the general name of *air*, have been ſo numerous and rapid, that they have at once raiſed this ſubject to the dignity of a *Science*, and now form a very conſiderable, as well as important, part of the modern ſyſtem of natural philoſophy.

Utility of the ſubject.

Thoſe diſcoveries, indeed, have not been more intereſting to philoſophers, than uſeful to ſcience and beneficial to ſociety. Many perplexing proceſſes in chemiſtry have been explained in conſequence of them, ſeveral have been facilitated, and a number of new and uſeful ones have been introduced. The phenomena attending metallic calcinations and reductions have been greatly elucidated. The knowledge of the uſe of the air in reſpiration; the method of aſcertaining its purity and fitneſs for that function; the inveſtigation of dephlogiſticated air; the method of impregnating water with fixed air; are all calculated to anſwer purpoſes of the higheſt utility. The medicinal properties of fixed air have been in a great meaſure aſcertained, and its antiſeptic qualities in other reſpects promiſe to be of conſiderable advantage. The method of aſcertaining the purity of the air of a place, and the manner of ventilating an apartment, are of great uſe for thoſe concerned in public buildings. In ſhort, there is perhaps no ſtation in life where ſome knowledge of this ſubject may not be of uſe.

Sect. I. *Of the general Conſtitution, Mechanical Properties, and Operations of the Air.*

1 Ancient opinions concerning the air.

§ 1. *The general Conſtitution of the Air we breathe.*—For many ages this fluid was ſuppoſed to be ſimple and homogeneous; its common operations to depend on its heat, cold, moiſture, or dryneſs; and any effects which could not be explained by theſe (ſuch as the appearance of peſtilential diſeaſes), were reckoned to be entirely ſupernatural, and the immediate effects of Divine power. But, however ſimple and homogeneous this fluid may have been thought in former times, it is ſo far from poſſeſſing the ſimplicity of an element, that it is the receptacle of all kinds of effluvia produced from terreſtrial ſubſtances either naturally or artificially. Hence, whatever may be the nature of the aërial fluid when abſolutely pure, that which we breathe, and commonly goes under the name of *air*, muſt be conſidered as an exceedingly heterogeneous mixture, various at various times, and which it is by no means poſſible to analiſe with accuracy.

2 Common air a very heterogeneous fluid.

3 In what manner it purifies itſelf.

Though, in this view, air ſeems to be a kind of ſink or common ſewer, where all the poiſonous effluvia ariſing from putrid and corrupted matters are depoſited; yet it has a wonderful facility of purifying itſelf, and one way or other of depoſiting thoſe vapours contained in it; ſo that it never becomes noxious except in particular places, and for a ſhort time; the general maſs remaining upon all occaſions pretty much the ſame. The way in which this purification is effected is different, according to the nature of the vapour with which the air is loaded. That which moſt univerſally prevails is water; and from experiments it appears, that the quantity of aqueous vapour contained in the atmoſphere is immenſe. Dr Halley, from an experiment on the evaporation from a fluid ſurface heated to the ſame degree with that given by our meridian ſun, has calculated, that the evaporation from the Mediterranean ſea alone is ſufficient to yield all the water of the

4 Vaſt quantities of water continually diſcharged into it by evaporation.

Of Air in general.

the rivers which run in to it. Dr Watson, in his Chemical Essays, has given an account of some experiments made with a view to determine the quantity of the water raised from the earth itself in time of drought. He informs us, that, when there had been no rain for above a month, and the grass was become quite brown and parched, the evaporation from an acre was not less than 1600 gallons in 24 hours. Making afterwards two experiments, when the ground had been wetted by a thunder-shower the day before, the one gave 1973, the other 1905, gallons in 12 hours. From this the air is every moment purified by the ascent of the vapour, which flying off into the clouds, thus leaves room for the exhalation of fresh quantities; so that as the vapour is considerably lighter than the common atmosphere, and of consequence ascends with great velocity, the air during all this time is said to be *dry*, notwithstanding the vast quantity of aqueous fluid that passes through it.

5
Different kinds of vapours which contaminate it.

Nor is it only from the aqueous vapour that the air is purified at this time. Much of that vapour arising from decayed and putrid animal and vegetable substances, and which by some modern philosophers is called *phlogiston*, attaches itself to the aqueous vapour, and ascends along with it. Another part is absorbed by vegetables; for the phlogistic vapour, as is shown under AGRICULTURE, n° 5. is probably the food of plants. The phlogistic vapours which ascend along with the water, probably continue there and descend along with the rain; whence the fertilizing qualities of rain-water above those of any other. Thus we may see why a dry air, whether cold or hot, must always be wholesome; but as the atmosphere cannot always *receive* vapours, it is obvious, that when great rains come on, especially if attended with heat, the lower regions of the air must be overloaded with vapours both of the aqueous and phlogistic kind, and of consequence be very unwholesome.

But besides the aqueous and phlogistic vapours, both of which are specifically lighter than common air, there are others, which, being specifically heavier, cannot be carried off in this manner. Hence these gross vapours contaminate certain places of the atmosphere, rendering them not only unhealthy, but absolutely poisonous. Of these are, 1. Sulphureous, acid, and metalline exhalations. These are produced principally by volcanoes; and as they descend, in consequence of their specific gravity, they suffocate and spread destruction all around them, poisoning not only animals, but vegetables also. 2. The vapours arising from houses where lead and other metals are smelted, have the same pernicious qualities; insomuch that the men who breathe them, the cattle who eat the grass, and the fishes who inhabit the waters on which they fall, are poisoned by them if taken into the body in a certain proportion. 3. Of the same kind are the *mofetes*, or emanations of fixed air, which sometimes proceed from old lavas, or perhaps from some other places even of the surface. From all these the air seems not capable of purifying itself, otherwise than either by dispersing them by winds, or by letting them subside by their superior gravity, till they are absorbed either by the earth or water, according as it is their nature to unite with one or other of these elements. 4. Of this kind also seem to be the vapours which are called properly *pestilential*. The contagion of the plague itself seems to be of an heavy sluggish nature, incapable of arising in the air, but attaching itself to the walls of houses, bed-cloaths, and wearing apparel. Hence scarce any constitution of the atmosphere can dispel these noxious effluvia; nor does it seem probable that pestilential distempers ever cease until the contagion has operated so long, and been so frequently communicated from one to another, that, like a ferment much exposed to the atmosphere, it becomes vapid, communicates a milder infection, and at last loses its strength altogether.

6
Specific gravity of the air.

§ 2. *Mechanical Properties of the* AIR.—In common with water, the air we breathe possesses *gravity*, and consequently will perform every thing in that way which water can do, making allowance for the great difference between the specific gravity of water and of air. This difference indeed is exceedingly great, and has been variously calculated. Ricciolus estimates the gravity of air to be to that of water as 1 to 1000; Mersennus, as 1 to 1300, or 1 to 1356; Lana, as 1 to 640; and Galileo, only as 1 to 400. Mr Boyle, by more accurate experiments, makes the air at London to be to water as 1 to 938; and thinks, that, all things considered, the proportion of 1 to 1000 may be taken as a medium. But by three experiments made since that time before the Royal Society, the specific gravity of the air was determined to be to that of water as 1 to 840, 852, and 860. By a very accurate experiment, Mr Hauksbee fixed the proportion as 1 to 885. But as all these experiments were made when the barometer was at $29\frac{1}{2}$ inches, Dr Jurin supposes, that, at a medium between heat and cold, when the barometer is 30 inches high, the proportion between the two fluids may be taken as 1 to 800; and this agrees with the observations of the Hon. Mr Cavendish, made when the barometer was at $29\frac{1}{2}$ inches, and the thermometer at 50.

7
Effects of the gravity of the air.

By means of its gravity, the air presses with great force upon all bodies, according to the extent of their surface. M. Pascal has computed the quantity of this pressure to be no less than 2232 pounds upon every square foot of surface, or upwards of 15 pounds on every square inch. According to some experiments made by M. Amontons and de la Hire, a column of air on the surface of the earth, and 36 fathoms high, is equal in weight to three lines depth of mercury. From the barometer, however, we know that the whole pressure of the atmosphere is very different; sometimes being equal only to a column of 28 inches, and varying from thence to 31 inches. The whole quantity of pressure must thus be immense, and has been computed equal to a globe of lead 60 miles in diameter.

By means of its gravity, the atmosphere accomplishes many useful purposes in nature. It prevents the arterial vessels of animals and the sap-vessels of plants from being too much distended by the expansive power (whatever it is), which has a perpetual tendency to swell them out. Thus we see, that, in the operation of cupping, where the pressure of the air is taken off from a particular part, the expansive force instantly acts, and swells out the vessels to a great degree. Hence also, when animals are put into an air-pump, their whole bodies swell.

Of Air in general.

By its gravity, the air promotes the union of fluid bodies, which would inftantly ceafe *in vacuo*. Thus oils and falts, which remain united in air, feparate as foon as that fluid is extracted. Hence alfo, when hot water is put under an exhaufted receiver, it boils violently; becaufe the preffure of the air being now taken off, the particles of fteam, which exifted invifibly among the water, and which the gravity of the atmofphere prevented from flying off fo foon, are now hurried up with great velocity, by means of the exceffive comparative gravity of the aqueous fluid.

On the gravity of the air depend the afcent of water in pumps, fyphons, &c. and likewife all the phenomena of the barometer.

8 Elafticity of the air.

Befides its gravity, which the air has in common with water and other fluids, there is another which it has only in common with fteam or vapour. This is called its *elafticity;* by which, like a fpring, it allows itfelf to be compreffed into a fmaller bulk, and then returns again to its original fize upon removing the preffure.

The elafticity of the air was firft afcertained by fome experiments of lord Bacon, who, upon this principle, conftructed the firft thermometer, which he called his *vitrum calendare.* Of this power we have numerous proofs. Thus, a blown bladder being fqueezed in the hand, we find the included air fenfibly refift; fo that, upon ceafing to comprefs, the cavities or impreffions made in its furface are readily expanded again and filled up.

The ftructure and office of the *Air*-Pump depend on this elaftic property. Every particle of air always exerts a nifus or endeavour to expand, and thus ftrives againft an equal endeavour of the ambient particles; whofe refiftance happening by any means to be weakened, it immediately diffufes itfelf into an immenfe extent. Hence it is that thin glafs bubbles, or bladders filled with air, and exactly clofed, being included in the exhaufted receiver of an air-pump, burft by the force of the air they contain; and a bladder almoft quite flaccid, fwells in the receiver and appears full. The fame effect alfo takes place, though in a fmaller degree, on carrying the flaccid bladder to the top of an high mountain.

9 Whether this property can be diminifhed.

It has been queftioned among philofophers, whether this elaftic power of the air is capable of being deftroyed or diminifhed. Mr Boyle made feveral experiments with a view to difcover how long air would retain its fpring after having affumed the greateft degree of expanfion his air-pump would give it; but he was never able to obferve any fenfible diminution. Defaguliers found, that air, after having been inclofed for half a year in a wind-gun, had loft none of its elafticity; and Roberval, after preferving it in the fame manner for 16 years, obferved, that its expanfive projectile force was the fame as if it had been recently condenfed. Neverthelefs, Mr Haukfbee concludes, from a later experiment, that the fpring of the air may be difturbed by a violent preffure, in fuch a manner as to require fome time to return to its natural tone. Dr Hales inferred, from a number of experiments, that the elafticity of the air is capable of being impaired and diminifhed by a variety of caufes.

The weight or preffure of the air has no dependence on its elafticity; but would be the fame whether it had fuch a property or not. The air, however, being elaftic, is neceffarily affected by the preffure, which reduces it into fuch a fpace, that the elafticity, which reacts againft the compreffing weight, is equal to that weight. In effect, the law of this elafticity is, that it increafes as the denfity of the air increafes; and the denfity increafes as the force increafes by which it is preffed. Now there muft neceffarily be a balance between the action and re-action; i. e. the gravity of the air which tends to comprefs it, and the elafticity by which it endeavours to expand, muft be equal. Hence the elafticity increafing, or diminifhing univerfally, as the denfity increafes or diminifhes, it is no matter whether the air be compreffed and retained in fuch a fpace by the weight of the atmofphere, or by any other means; it muft endeavour in either cafe to expand with the fame force. And hence, if air near the earth be pent up in a veffel, and all communication with the external fluid cut off, the preffure of the inclofed air will be equal to the weight of the atmofphere at the time the quantity was confined. Accordingly, we find mercury fuftained to the fame height, by the elaftic force of air inclofed in a glafs veffel, as by the whole atmofpherical preffure. On the fame principle air may be artificially condenfed; and hence the ftructure of the Air-*Gun*.

10 Utmoft limits of its condenfation and expanfion.

The utmoft limits to which air, of the denfity which it poffeffes at the furface of the earth, is capable of being compreffed, have not been afcertained. Mr Boyle made it 13 times more denfe; Dr Halley fays that he has feen it compreffed fo as to be 60 times denfer than in its natural ftate, which is farther confirmed by M. Papin and M. Huygens. Dr Hales, by means of a prefs, condenfed it 38 times; and by forcing water in an iron ball or globe, into 1551 times lefs fpace than it naturally occupies. However, Dr Halley has afferted, in the Philofophical Tranfactions, Abr. vol. ii. p. 17. that from the experiments made at London, and by the academy del Cimento at Florence, it might be fafely concluded, that no force whatever is able to reduce air into 800 times lefs fpace than that which it naturally poffeffes on the furface of our earth. In anfwer to this, M. Amontons, in the Memoirs of the French Academy, maintains, that there is no fixing any bounds to its condenfation; that greater and greater weights will ftill reduce it into lefs and lefs compafs; that it is only elaftic in virtue of the fire which it contains; and that as it is impoffible ever to drive all the fire out of it, it is impoffible ever to make the utmoft condenfation.

The dilatation of the air, by virtue of its elaftic force, is found to be very furprifing; and yet Dr Wallis fuggefts, that we are far from knowing the utmoft of which it is capable. In feveral experiments made by Mr Boyle, it dilated firft into nine times its former fpace; then into 31 times; then into 60; then into 150. Afterwards it was brought to dilate into 8000 times its fpace, then into 10,000, and even at laft into 13,679 times its fpace; and this altogether by its own expanfive force, without the help of fire. On this depend the ftructure and ufe of the Manometer.

Hence it appears, that the air we breathe near the furface of the earth is compreffed by its own weight into at leaft the 13,679th part of the fpace it would poffefs *in vacuo*. But if the fame air be condenfed by art,

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art, the space it will take up when most dilated, to that it possesses when condensed, will be, according to the same author's experiments, as 550,000 to 1.

11 Expansion of the air by heat.

M. Amontons, and others, we have already observed, attribute the rarefaction of the air wholly to the fire contained in it; and therefore, by increasing the degree of heat, the degree of rarefaction may be carried still farther than its spontaneous dilatation. Air is expanded one-third of its bulk by boiling water.

Dr Hales found, that the air in a retort, when the bottom of the vessel was just beginning to be red-hot, was expanded through twice its former space; and in a white, or almost melting heat, it occupied thrice its former space; but Mr Robins found it was expanded by the heat of iron, just beginning to be white, to four times its former bulk. On this principle depend the structure and office of the THERMOMETER.

M. Amontons first discovered that air will expand in proportion to its density with the same degree of heat. On this foundation the ingenious author has a discourse, to prove "that the spring and weight of the air, with a moderate degree of warmth, may enable it to produce even earthquakes, and other of the most vehement commotions of nature." See the article EARTHQUAKE.

12 General effects of the air's elasticity.

The elastic power of the air, then, is the second great source of the effects of this important fluid. Thus it insinuates into the pores of bodies; and, by possessing this prodigious faculty of expanding, which is so easily excited, it must necessarily put the particles of bodies into which it insinuates itself into perpetual oscillations. Indeed, the degree of heat, and the air's gravity and density, and consequently its elasticity and expansion, never remaining the same for the least space of time, there must be an incessant vibration or dilatation and contraction in all bodies.

We observe this reciprocation in several instances, particularly in plants, the air-vessels of which do the office of lungs; for the contained air alternately expanding and contracting, according to the increase or diminution of the heat, alternately presses the vessels and eases them again, thus keeping up a perpetual motion in their juices.

Hence we find, that no vegetation or germination will proceed *in vacuo*. Indeed, beans have been observed to grow a little tumid therein; and this has led some to attribute that to vegetation which was really owing to no other cause than the dilatation of the air within them. The air is very instrumental in the production and growth of vegetables, not only by invigorating their several juices while in an elastic active state, but also by greatly contributing in a fixed state to the union and firm connection of their several constituent parts.

From the same cause it is, that the air contained in bubbles of ice, by its continual action bursts the ice. Thus also, entire columns of marble sometimes cleave in the winter time, from the increased elasticity of some little bubble of air contained in them. From the same principle arise all putrefaction and fermentation; neither of which will proceed, even in the best disposed subjects, *in vacuo*.

Since we find such great quantities of elastic air generated in the solution of animal and vegetable substances, a good deal must constantly arise from the dissolution of these aliments in the stomach and bowels, which is much promoted by it; and, in reality, all natural corruption and alteration seem to depend on air.

§ 3. *Effects of the different Ingredients of Air.*—This fluid acts not only by its common properties of gravity and elasticity, but produces numerous other effects arising from the peculiar ingredients of which it consists.

13 Solvent power of the air on metals.

Thus, 1. It not only dissolves and attenuates bodies by its pressure and attrition, but as a chaos containing all kinds of menstrua, and consequently possessing powers for dissolving all bodies. It is known that iron and copper readily dissolve and become rusty in air, unless well defended with oil. Boerhaave assures us, that he has seen pillars of iron so reduced by air, that they might be crumbled to dust between the fingers; and as for copper, it is converted by the air into a substance much like the verdigrise produced by vinegar.

Mr Boyle relates, that in the southern English colonies the great guns rust so fast, that after lying in the air for a few years, large cakes of crocus martis may be separated from them. Acosta adds, that in Peru the air dissolves lead, and considerably increases its weight. Yet gold is generally esteemed indissoluble by air, being never found to contract rust, though exposed to it ever so long. In the laboratories of chemists, however, where aqua regia is prepared, the air becoming impregnated with a quantity of the vapour of this menstruum, gold contracts a rust like other bodies.

14 On stones.

Stones also undergo the changes incident to metals. Thus Purbeck stone, of which Salisbury cathedral consists, is observed gradually to become softer, and to moulder away in the air; and Mr Boyle gives the same account of Blackington stone. He adds, that air may have a considerable operation on vitriol, even when a strong fire could act no farther upon it. And he has found, that the fumes of a corrosive liquor work more suddenly and manifestly on a certain metal when sustained in the air, than the menstruum itself did, which emitted fumes on those parts of the metal which it covered; referring to the effects of the effluvia of vinegar on copper.

The dissolving power of air is increased by heat, and by other causes. It combines with water; and by access of cold, deposites part of the matter which was kept dissolved in it by a greater degree of heat. Hence the water, by being deposited and condensed upon any cold body, such as glass, &c. in windows, forms fogs, and becomes visible.

15 Various chemical effects of the air.

In the various operations of chemistry, air is a very necessary and important agent; the result of particular processes depending on its presence or absence, on its being open or inclosed. Thus, the parts of animals and vegetables can only be calcined in open air; in close vessels they never become any other than black coals. And these operations are affected by the changes to which the air is liable. Many instances might be adduced to this purpose. Let it suffice to observe, that it is very difficult to procure oil of sulphur, *per campanam*, in a clear dry atmosphere; but in a thick moist air it may be obtained with greater ease, and in larger quantities. So, pure well-fermented wine, if it be carried to a place where the air is replenished with the

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the fumes of new wine then fermenting, will begin to ferment afresh.

The changes in the air arise from various causes, and are observable, not only in its mechanical properties, such as gravity, density, &c. but in the ingredients that compose it. Thus, at Fashlun in Sweden, noted for copper-mines, the mineral exhalations affect the air in such a manner as to discolour the silver coin in purses; and the same effluvia change the colour of brass. In Carniola, Campania, &c. where are mines of sulphur, the air sometimes becomes very unwholesome, which occasions frequent epidemic diseases, &c.

The effluvia of animals also have their effect in varying the air; as is evident in contagious diseases, plagues, murrains, and other mortalities, which are spread by an infected air.

For the vivifying principle of air, see the article Blood.

Sect. II. *Historical Account of the principal Discoveries concerning the Composition of Atmospherical Air and other Aërial Fluids.*

While the preceding discoveries were making concerning the mechanical and other properties of the air, little notice seems to have been taken of the elementary parts of the air itself, or the different kinds of fluid which go under that name. It was known, indeed, that air was separable from terrestrial bodies by means of fire, fermentation, &c. but this was commonly reckoned to be the same with what we breathe.

16 Van Helmont the first discoverer of different kinds of air.

Van Helmont, a disciple of Paracelsus, was the first who undertook to make inquiries concerning this species of air. He gave it the name of *gas sylvestre*, from the Dutch word *ghoast*, signifying spirit; and observes, that some bodies resolve themselves almost entirely into it. "Not (says he) that it had been actually contained in that form in the bodies from which it was separated; but it was contained under a concrete form, as if fixed, or coagulated." According to this author, the gas sylvestre is the same with what is separated from all substances by fermentation; from vegetables by the action of fire; from gun-powder when it explodes; and from charcoal when burning. On this occasion he asserts, that 62 pounds of charcoal contain 61 pounds of gas and only one pound of earth. To the effluvium of gas he also attributes the fatal effects of the grotto del Cani in Italy, and the suffocation of workmen in mines. He asserts, that it is to the corruption of the aliment, and the gas discharged from it, that we are to attribute wind, and the discharges of it from the bowels. Upon the same principles he accounts for the swelling of dead bodies which have remained for a time under water, and for the tumours which arise on some parts of the body in certain diseases. He also determines, that this gas is different from the air we breathe; that it has a greater affinity with water: and he imagined it might consist of water reduced to vapours, or a very subtile acid combined with volatile alkali.

17 Discoveries by Mr Boyle.

Mr Boyle repeated all Van Helmont's experiments to more advantage than he himself had performed them; but seems not to have proceeded further in his discoveries than Van Helmont did: only he found some bodies, such as sulphur, amber, camphor, &c. diminish the volume of air in which they burn.

18 By Dr Hales

Dr Hales first attempted to determine the quantity of air produced from different bodies; for which purpose he made experiments on almost every known substance in nature, examining them by distillation, fermentation, combustion, combinations, &c.

19 Suspicion of air in mineral waters.

He also first suspected, that the briskness and sparkling of the waters, called *acidulous*, were owing to the air they contained. But notwithstanding all his discoveries concerning the quantity of elastic fluid obtained from different bodies, he did not imagine there was any essential difference between this fluid and the air we breathe; only that the former was loaded with noxious vapours, foreign to its nature.

20 Confirmed by Mr Venel.

His suspicion concerning this impregnation was confirmed by M. Venel, professor of chemistry at Montpelier, in a memoir read before the Royal Academy of Sciences in 1750. This gentleman was able to disengage the air from the Seltzer waters, and to measure its quantity; which he constantly found to amount to about one-fifth of its bulk. The water thus deprived of its air became flat, and ceased to sparkle; the only difference then betwixt it and common water was, that the former contained a small quantity of sea-salt. Upon these principles he attempted to recompose Seltzer water, by dissolving in a pint of common water two drachms of fossile alkali, and then adding an equal quantity of marine acid. The quantity of sea-salt produced by the union of these two, he knew would prove equal to that contained in a pint of Seltzer water; and the effervescence produced by the action of the acid and alkali upon each other, he imagined, would produce air sufficient for the impregnation of the water. In this he was not deceived; the water thus produced was not only analogous to Seltzer, but much more strongly impregnated with air.

21 Discoveries by Dr Black, &c.

Dr Black first discovered, that chalk, and the other earths reducible to quicklime by calcination, consist of an alkaline earth, by itself soluble in water, but which, combined with a large quantity of fixed air, becomes insoluble; losing the properties of quicklime, and assuming the natural appearance we observe those earths to have when not reduced into lime. The same thing he discovered in magnesia alba, and in alkalis both fixed and volatile. On the fixed air contained in these bodies, he found not only their property of effervescing with acids to depend, but likewise their mildness; both the alkalis and calcareous earth being highly caustic when deprived of their fixed air. He also found, that this fluid, which he called *fixed air*, had different degrees of affinity with different substances; that it was stronger with calcareous earth than with fixed alkali; with fixed alkali, than magnesia; and with magnesia, than volatile alkali. He also suspected, that the fixed air of alkaline salts unites itself with the precipitates of metals, when thrown down from acids; and that the increase of weight observable in these precipitates was owing to this cause. But he was of opinion, that the fluid which he called *fixed air* was very different from the common air we breathe; and therefore adopted the name of air, merely as one already established, whatever impropriety there might be in the term.

It was not long before the discovery of this species of air suggested new theories in physiology and natural philosophy. Mr Haller had inferred, from Dr Hales's experiments,

Of Air in general. experiments, that air is the real cement of bodies; which, fixing itself in the solids and fluids, unites them to each other, and serves as a bond by which they are kept from dissolution. In 1764, Dr Macbride of Dublin published a number of experiments in support of this doctrine. From his work it appears, that fixed air is separated, not only from all substances in fermentation, but also from all animal substances as they begin to putrefy; and that this air is capable of uniting itself to all calcareous earths, as well as alkalis both fixed and volatile, and restoring to them the property of effervescing with acids when they have by any means been deprived of it. But though these opinions have since been found erroneous, the conclusions drawn by him from his numerous experiments still hold good, viz. that fixed air is an elastic fluid, very different from the common air we breathe: that it is possessed of a strong antiseptic quality, and may be introduced with safety into the intestinal canal, and other parts of the animal œconomy, where common air would have fatal effects; but is mortal if breathed into the lungs, &c.

22 Quantity of fixed air contained in alkaline salts determined by Mr Cavendish.

In 1766 and 1767, Mr Cavendish communicated some new experiments to the Royal Society at London, wherein he determines the quantity of air contained in fixed alkali, when fully saturated with it, to be five-twelfths of its weight, and seven-twelfths in volatile alkali: that water is capable of absorbing more than its own bulk of this air; that it has then an agreeable, spirituous, and acidulous taste; and that it has the property of dissolving calcareous earths and magnesia, as well as almost all the metals, especially iron and zinc: that the vapour of burning charcoal occasions a remarkable diminution of common air, at the same time that a considerable quantity of fixed air is produced in the operation. He also found, that solution of copper in spirit of salt, instead of producing inflammable air, like that of iron or zinc, afforded a species of air which lost its elasticity as soon as it came into contact with water.

23 Contest concerning the doctrine of fixed air.

The discoveries of Dr Black concerning fixed air had not been long published, when they were violently attacked by some foreign chemists, while his cause was as eagerly espoused by others. The principal opponents were Mr Meyer apothecary at Osnabruck, Mr Crans physician to his Russian Majesty, and Mr de Smeth at Utrecht. Their arguments, however, were effectually answered at the time by Mr Jacquin, botanical professor at Vienna; and the numerous discoveries made since that time have given such additional confirmation to his doctrine, that it is now universally adopted by chemists both in Britain and other countries.

24 Composition of the atmosphere discovered.

It was reserved, however, for Dr Priestley to make the great discovery concerning the nature of our atmosphere; and to inform the world, that it is composed of two fluids; the one absolutely noxious, and incapable of supporting animal life for a moment; the other extremely salutary, and capable of preserving animals alive and healthy for a much longer time than the purest air we can meet with. This may be considered as the ultimate period of our history: for since that time the discoveries of philosophers still living, in many different countries, have been so rapid, that it is difficult to ascertain the dates of them by any authentic documents; especially as, by reason of such numerous experiments, the same things have not unfrequently been discovered by different persons unknown to each other. We shall therefore proceed to give an account of the different kinds of aërial fluids, beginning with those which are known, or supposed, to constitute a part of our atmosphere.

Sect. III. *Of Dephlogisticated Air.*

Dephlogisticated Air.

§ 1. *Discovery and Methods of procuring this Kind of Air.*—Dephlogisticated air was first obtained by Dr Priestley on the 1st of August 1774. The circumstances which led him to the discovery, were his having always procured inflammable air from spirit of salt, by adding to it spirit of wine, oil of olives, oil of turpentine, charcoal, phosphorus, bees wax, and even sulphur. Hence he suspected, that the common air we breathe might be composed of some kind of acid united with phlogiston. On this supposition he extracted air from mercurius calcinatus *per se*, by exposing it to the focus of a burning-glass 12 inches in diameter; and, having repeated the experiment with red precipitate and minium, he found, that though a quantity of fixed air was always produced, yet after that was separated, the remainder supported flame much more vigorously than common air; for a candle burned in it with a flame very much enlarged, and with a crackling noise, at the same time that it appeared fully as much diminished by the test of nitrous air. Whence he concluded, that it was respirable; and, on making the experiment, found that it actually was so, for a mouse lived a full half hour in a quantity of this fluid; which, had it been common air, would only have kept it alive half that time. Nor did the animal seem to be otherwise injured than by the cold; as it presently revived on bringing it near the fire, and the remainder of the air still appeared better than that of the atmosphere, when the test of nitrous air was applied to it.

25 Whence first extracted.

26 Why named dephlogisticated.

This pure kind of air being discovered, the Doctor next proceeded to name it *dephlogisticated*, from his opinion that common air, in the act of burning, absorbed phlogiston; of consequence, he supposed, that which absorbed the most, or which most vigorously and for the greatest length of time supported flame, was supposed to contain the smallest quantity of this substance. In the course of his inquiries why this kind of air comes to be so much dephlogisticated, he fell upon a method of extracting it from a great variety of substances; viz. by moistening them with spirit of nitre, and then distilling them with a strong heat. Thus he obtained it from flowers of zinc, chalk, quicklime, slacked lime, tobacco-pipe clay, flint, Muscovy talcs, and even glass. He then found, that by simply dissolving any metal in the nitrous acid, and then distilling the solution, he could obtain very pure air: and Mr Warltire found even the trouble of distillation unnecessary; nothing more being requisite than to moisten red lead with the spirit of nitre, and then pour upon it the oil of vitriol, which instantly disengaged the dephlogisticated air without applying any more heat than what was generated by the mixture.

27 Produced from a great variety of substances.

28 This kind of air discovered also by Mr Scheele.

While discoveries of this kind engaged Dr Priestley in England, Mr Scheele was employed in a similar manner in Sweden; and had actually obtained the same kind of air, without knowing any thing of what Dr Priestley had done. The latter had the merit of the

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prior discovery: but Mr Scheele's method was more simple, consisting only in the distillation of nitre with a strong heat; by which means it is now found that dephlogisticated air may be obtained in very considerable quantity, and in as great purity, as by the more expensive processes. The pure air from nitre had indeed partly been obtained, by Dr Hales long before this time; since he informs us, that half a cubic inch of nitre yielded 90 cubic inches of air, which was undoubtedly the fluid we speak of; but as he neglected to prosecute the discovery, nothing farther was known at that time.

29 May be produced without nitrous acid.

As the nitrous acid was universally concerned in the first processes for obtaining this kind of air, it was for some time generally believed to be a peculiar property of that acid alone to produce it; but the indefatigable genius of Dr Priestley soon found, that it might not only be procured where no nitrous acid was employed, but where the substances were treated with vitriolic acid. It was indeed evident, from the very first experiment, that nitrous acid was not essentially necessary; since pure air was procured from precipitate *per se*, in the preparation of which no nitrous acid is employed. The Abbé Fontana found, that 192 grains of this substance yielded $26\frac{1}{2}$ cubic inches of dephlogisticated air, at the same time that the weight of it was reduced to $178\frac{8}{9}$ grains, which is nearly the weight of that quantity of air. It had formerly been observed, that the weight of mercury is augmented during its conversion into precipitate *per se*, as that of lead is by its conversion into minium. The experiments just now mentioned, therefore, show, that during this process the air is decompounded; the pure dephlogisticated part of it being absorbed by the metal, and appearing again on the application of heat; and the same appears to be the case with red lead, from the experiment of Mr Warltire already mentioned. With regard to this last substance, however, a very great singularity is observed; viz. that when newly prepared it yields none at all, and even for some time after the produce is much smaller than when it has been long kept. The reason of this seems to be, that the minium still contains a considerable quantity of phlogiston, which flies off into the atmosphere by long keeping, a larger quantity of the dephlogisticated part of the atmosphere being imbibed at the same time. The mode of applying heat has also a very considerable effect on the quantity of air produced. Thus, Dr Priestley remarks *, that "from equal quantities of red lead, without any mixture of spirit of nitre, and using the same apparatus for distilling it, he obtained, by means of heat applied suddenly, more air than when slowly applied, in the proportion of ten to six. The proportion of fixed air was the same in both cases, and the remainder equally dephlogisticated."

* Exper. and Observ. iii. 37.

30 Produced in greatest quantities by a quick and violent heat.

31 Method of extracting it from various substances.

By heat alone, the Doctor found, that sedative salt, manganese, lapis calaminaris, and the mineral called *lapis ponderosus*, *wolfram*, or *tungsten*, would yield dephlogisticated air; the first indeed in very small quantity, and sometimes even of a quality very little superior to common air. In these experiments, he made use of small-bellied retorts of green glass, which can stand the fire best, containing about an ounce of water, and having narrow necks 18 or 20 inches long. The substance to be examined was put into a retort of this kind, and then exposed to a red heat, either in sand or over a naked fire, while the neck of the vessel was plunged in water or mercury.

Having dissolved six pennyweights of very clean iron in oil of vitriol, and then distilled the solution to dryness in a long-necked retort, he received the common air a little phlogisticated, some fixed air, much vitriolic acid air, and lastly 18 ounce measures of dephlogisticated air. The iron that remained undissolved weighed 23 grains, so that the air was yielded by five pennyweights one grain of iron. The ochre weighed seven pennyweights thirteen grains: so that, says he, there probably remained a quantity of oil of vitriol in it; and consequently, had the heat been greater, more air would have been obtained.

In his experiments with the nitrous acid, as it had constantly been found, that by pouring on more nitrous acid on the residuum, and repeating the operation, more dephlogisticated air might be obtained, the Doctor determined to try whether the same would not hold good with vitriolic acid also. For this purpose, he added more oil of vitriol to the residuum of the last-mentioned experiment. When in a red heat with a glass retort, it yielded a quantity of vitriolic acid air, no fixed air, but about 24 ounce measures of dephlogisticated air; when, the retort being melted, a good deal of the air was necessarily lost; but, on resuming the process in a gun-barrel, he procured as much air as had been got before.—Pursuing these experiments, he obtained with common crust of iron and oil of vitriol, dephlogisticated air at the first distillation, and a great deal more from the residuum, by pouring fresh oil of vitriol upon it. The same product he obtained from blue vitriol, solution of copper in the vitriolic acid, and from a solution of mercury in that acid. On this substance he remarks, that "either by means of oil of vitriol or spirit of nitre, it yields a great quantity of dephlogisticated air: but with this difference, that in the process with spirit of nitre, almost the whole of the mercury is revived (not more than a twentieth part being lost, if the process be conducted with care); but in that with vitriolic acid, almost the whole is lost." From the later experiments of Mr Lavoisier, however, it appears that the Doctor's process had not been conducted with sufficient care; as from two ounces of the dry salt formed by a combination of vitriolic acid with mercury, the former obtained 6 drachms 12 grains of running mercury, besides 3 drachms 58 grains of mercurial sublimate of two different colours. Dephlogisticated air was likewise obtained from pure calx of tin, or putty, mixed with oil of vitriol; but none in any trial with the marine acid, excepting when it was mixed with minium; in which case the air obtained was probably that which the minium would have yielded without any addition.

The result of all these, and innumerable other experiments made by philosophers in different countries, was, that dephlogisticated air may be obtained from a vast variety of mineral and metallic substances by means of the vitriolic and nitrous acids. It now remained only to discover in what manner this fluid, so essentially necessary to the support of animal life, is naturally produced in quantities sufficient for the great expence of it throughout the whole world, by the breathing of animals, the support of fires, &c. This discovery, indeed,

32 How dephlogisticated air is naturally produced.

Dephlogisticated Air. deed, had been made before even the existence of dephlogisticated air itself was known. Dr Priestley, after having tried various methods of purifying contaminated air unsuccessfully, found at last, that some kinds of vegetables answered this purpose very effectually; for which discovery he received the thanks of the Royal Society. Among the vegetables employed on this occasion, he found mint answer the purpose very effectually. "When air," says he*, "has been freshly and strongly tainted with putrefaction, so as to smell through the water, sprigs of mint have presently died upon being put into it, their leaves turning black; but if they do not die presently, they thrive in a most surprising manner. In no other circumstances have I seen vegetation so vigorous as in this kind of air, which is immediately fatal to animal life. Though these plants have been crowded in jars filled with this kind of air, every leaf has been full of life; fresh shoots have branched out in various directions, and grown much faster than other similar plants growing in the same exposure in common air."—Having in consequence of this observation rendered a quantity of air thoroughly noxious, by mice breathing and dying in it, he divided it into two receivers inverted in water, introducing a sprig of mint into one of them, and keeping the other receiver unaltered. About eight or nine days after, he found that the air of the receiver into which he had introduced the sprig had become respirable; for a mouse lived very well in this, whereas it died the moment it was put into the other.

* Exper. and Observ. vol. i. p. 1. sect. 4.

33 Noxious air improved by vegetating mint.

34 Experiments seemingly contradictory.

From these experiments the Doctor at first concluded, that in all cases the air was meliorated by the vegetation of plants: but even in his first volume he observes, that some experiments of this kind did not answer so well towards the end of the year as they had done in the hot season; and a second course seemed to be almost entirely contrary to the former. Having tried the power of several sorts of vegetables upon air infected by respiration or by the burning of candles, he found that it was generally rendered worse by their vegetation; and the longer the plants were kept in the infected air, the more they phlogisticated it; though in several cases it was undoubtedly meliorated, especially by the shoots of strawberries and some other plants, introduced into the vials containing foul air, and inverted in water, which were placed near them, whilst their roots continued in the earth in the garden. Sometimes the infected air was so far mended by the vegetation of plants, that it was in a great measure turned into dephlogisticated air. "On the whole," says Dr Priestley, "I still think it probable, that the vegetation of healthy plants, growing in situations natural to them, have a salutary effect on the air in which they grow.—For one instance of the melioration of air in these circumstances should weigh against an hundred, in which the air is made worse by it, both on account of the disadvantages under which all plants labour, in the circumstances in which these experiments must be made, as well as the great attention and many precautions that are requisite in conducting such a process."

* Exper. and Observ. iv. 302.

35 Experiments of Dr Ingenhousz on the melioration of air by vegetation.

At the time that Dr Priestley made these experiments, he supposed that the air was meliorated merely by the absorption of phlogiston from that which had been tainted; but the experiments of Dr Ingenhousz, made in 1779, showed that this was accomplished, not only by the absorption just mentioned, but by the emission of dephlogisticated air. He observed in general, that plants have a power of correcting bad air, and even of improving common air in a few hours, when exposed to the light of the sun; but, in the night-time, or when they are not influenced by the solar rays, they contaminate the air. This property, however, does not belong in an equal degree to all kinds of plants: nor is it possible to discover by the external properties of a plant, whether it be fit for this purpose or not; as some which have a bad smell, and are entirely unfit for food, show themselves much superior to others whose external appearance would seem preferable. His method of making the experiment was, to fill a vial with air, fouled either by respiration or combustion; after which a sprig of any plant was introduced, by passing it through the water in which the vial was immersed. The vial was then stopped; or it was removed into a small bason full of water, and exposed to the sun, or situated in some other proper place as occasion required. Air phlogisticated by breathing, and in which a candle could not burn, after being exposed to the sun for three hours, with a sprig of peppermint in it, was so far corrected, as to be again capable of supporting flame. The following experiment, however, made with a mustard plant, may be looked upon as decisive: A plant of this kind was put into a glass receiver containing common air, and its stem cut off even with the mouth of the receiver. The vessel was then inverted in an earthen pan, containing some water to keep the plant alive, and the whole apparatus was set over-night in a room. Next morning the air was found so much contaminated, that it extinguished the flame of a wax taper. On exposing the apparatus to the sun for a quarter of an hour, the air was found to be somewhat corrected; and after an hour and an half it was so far improved, that by the test of nitrous air it appeared considerably better than common air.

36 Dephlogisticated air produced from water.

Before we proceed farther in the account of Dr Ingenhousz's experiments, it will be necessary to relate some observations made by Dr Priestley; from which it appears, that dephlogisticated air, in very considerable quantity, may, in certain circumstances, be procured from water alone. The substance of these is, that water, especially pump-water, when exposed to the light of the sun, emits air slowly: but after some time a green matter appears on the bottom and sides of the glass; after which it emits very pure air in great quantity, and continues to do so for a very long time, even after the green matter has shown some symptoms of decay by becoming yellow. He observed, that the water which naturally contained the greatest quantity of fixed air, yielded also the greatest quantity of that which was dephlogisticated; but that the quantity of the latter much exceeded that of the fixed air contained even in any water. The light of the sun was found to be an essential requisite in the formation of this air, as very little, and that of a much worse quality, was produced in the dark.

37 From the leaves of plants.

As the green matter produced in Dr Priestley's glasses, was by himself, as well as others, considered as belonging to the vegetable kingdom, Dr Ingenhousz improved upon his process, by putting the leaves of plants into water, and exposing them to the sun. All plants were not equally fit for producing dephlogisticated air by

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by this method more than by the other. Some poisonous plants, as the hyoscyamus, lauro-cerasus, night-shade, the tobacco-plant, a triplex vulvaria, cicuta aquatica, and sabina, were found very fit for the purpose; but the purest kind of air was extracted from some aquatic vegetables, the turpentine-trees, and especially from the green matter he collected in a stone trough which was kept continually filled with water from a spring near the high-road. The purity of this dephlogisticated air, he says, was equal, if not superior, to that procured by the best chemical processes; as it sometimes required eight times its own quantity of nitrous air to saturate it. All parts of the plants were not found equally proper for the production of dephlogisticated air; the full grown leaves yielded it in greatest quantity and purity, especially from their under surface. It was also procured from the green stalks.—One hundred leaves of *Nasturtium Indicum*, put into a jar holding a gallon, filled with ordinary pump-water, and exposed to the sun from 10 to 12 o'clock, yielded as much air as filled a cylinderical jar four inches and an half in length, and one and three quarters in breadth. On removing this quantity of air, and exposing them again to the sun till seven o'clock, about half as much was produced, of a quality still superior to the former; and next morning by eleven o'clock, they yielded as much more of an equal quality. The roots of plants, he says, when kept out of ground, generally yield bad air, and at all times contaminate common air, a few only excepted. Flowers and fruits, in general, yield a very small quantity of noxious air, and contaminate a great quantity of common air at all times, especially in the night, and when kept in the dark. Two dozen of young and small French beans, kept in a quart-jar of common air for a single night, contaminated the air to such a degree, that a very lively chicken died by being confined in it less than half a minute.

38 Conclusions from Dr Ingenhousz's experiments.

The observations of Dr Ingenhousz on the whole, says Mr Cavallo, clearly show, "that the vegetation of plants is one of the great means employed by nature to purify the atmosphere, so as to counteract, in great measure, the damage done by animal respiration, combustion, &c. It may only be said, that vegetation does not appear to be sufficient to remedy entirely that damage." The Doctor himself, however, speaks very highly of the powers of vegetables in this respect. He informs us, that their office in yielding dephlogisticated air begins a few hours after the sun has made his appearance in the horizon, or rather after it has passed the meridian, and ceases with the close of day; excepting some plants which continue it a short time after sunset: The quantity of dephlogisticated air, yielded by plants in general, is greater in a clear day than when it is somewhat cloudy. It is also greater when the plants are more exposed to the sun, than when they are situated in shady places. He observes, moreover, that the damage done by plants in the night, is more than counterbalanced by the benefit they afford in the day-time. "By a rough calculation, (says he), I found the poisonous air, yielded by any plant during the whole night, could not amount to onehundredth part of the dephlogisticated air which the same plant yielded in two hours time in a fair day."—It does not appear, however, that plants yield dephlogisticated air by any kind of generation of that fluid, but only by filtrating the common air, which all plants absorb through their pores; the phlogistic part becoming part of their substance, and probably being the true vegetable food, as is explained more at large under the article AGRICULTURE.—Dry plants have little or no effect upon the air until they are moistened—On all these experiments, however, it must be observed, that they have sometimes failed in the hands of those whom we cannot but suppose very capable of trying them; as Mr Scheele, Mr Cavallo, and the Abbé Fontana.

39 Sir Benjamin Thomson's experiments.

After the publication of Dr Ingenhousz's experiments, it became generally believed, that the atmosphere was meliorated by the common process of vegetation, and that plants absorbed the phlogistic part as their food, discharging the pure dephlogisticated air as an excrement; which is just the reverse of what happens to animals, who absorb the pure part in respiration, and reject the phlogistic. In the Philosophical Transactions for 1787, however, we find a number of experiments related by Sir Benjamin Thompson, which seem to render this matter dubious.—One very considerable objection is, that the green matter, already mentioned in Dr Priestley's experiments, when carefully observed by a good microscope, appears not to be of a vegetable, but of an animal nature.

40 Green matter observed by Dr Priestley, said to be of an animal nature.

The colouring matter of the water, says he, is evidently of an animal nature; being nothing more than the assemblage of an infinite number of very small, active, oval-formed animalcules, without any thing resembling *tremella*, or that kind of green matter or water-moss which forms upon the bottom and sides of the vessel when this water is suffered to remain on it for a considerable time, and into which Dr Ingenhousz supposes the animalcules above mentioned to be actually transformed.

This gentleman has also found, that several animal substances, as well as vegetables, have a power of separating dephlogisticated air from water when exposed to the light of the sun, and that for a very great length of time. Not that the same quantity of water will always continue to furnish air; but the same animal substance being taken out, washed, and again put into fresh water, seems to yield dephlogisticated air, without any kind of limitation.

41 Dephlogisticated air produced by raw silk.

Raw silk possesses a remarkable power of this kind. To determine it, Sir Benjamin introduced 30 grains of this substance, previously washed in water, into a thin glass globe $4\frac{1}{2}$ inches in diameter, having a cylindrical neck $\frac{3}{4}$ths of an inch wide, and twelve inches long, inverting the globe into a jar filled with the same kind of water, and exposing it to the action of the sun in the window. It had not been ten minutes in this situation, when the silk became covered with an infinite number of air-bubbles, gradually increasing in size, till, at the end of two hours, the silk was buoyed up, by their means, to the top of the water. By degrees they began to separate themselves, and form a collection of air in the upper part of the globe; which, when examined by the test of nitrous air, appeared to be very pure. In three days he had collected $3\frac{1}{4}$ cubic inches of air; into which a wax-taper being introduced, that had just before been blown out, the wick only remaining red, it instantly took fire, and burned with a bright and enlarged flame. The water in the globe appeared to have lost something of its transparency, and had changed its colour to a very faint greenish cast, having at

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at the ſame time acquired the ſmell of raw ſilk.—This was ſeveral times repeated with freſh water, retaining the ſame ſilk, and always with a ſimilar reſult; but with this difference, that when the ſun ſhone very bright, the quantity of air produced was not only greater, but its quality ſuperior to that yielded when the ſun's rays were feeble, or when they were frequently intercepted by flying clouds. "The air, however, (ſays he), was always not only much better than common air, but even than that produced by the freſh leaves of plants expoſed in water to the ſun's rays in the experiments of Dr Ingenhouſz; and, under the moſt favourable circumſtances, it was ſo good, that one meaſure of it required four of nitrous air to ſaturate it, and the whole five meaſures were reduced to 1.35."

42 No air produced in the dark.

An experiment was next made in order to determine the effect of darkneſs upon the production of air: and in this caſe only a few inconſiderable bubbles were formed, which remained attached to the ſilk; nor was the caſe altered by removing the globe into a German ſtove. Some ſingle bubbles, indeed, had detached themſelves from the ſilk and aſcended to the top, but the air was in too little quantity to be meaſured or proved.—The medium heat of the globe, when expoſed to the ſun's rays, was about 90° of Fahrenheit, though ſometimes it would riſe as high as 96; but air was frequently produced, when the heat did not exceed 65 and 70°.—On reverſing this experiment, in order

43 Effects of light without heat.

to try the effect of light without heat, it was found, that by plunging the globe into a mixture of ice and water, which brought it to the temperature of about 50° of Fahrenheit, the produce of air was dimiuiſhed, though it ſtill continued in conſiderable quantity.

44 Of artificial light.

The effect of artificial light, inſtead of that of the ſun, was next tried. For this purpoſe all the air was removed from the globe; and its place being ſupplied with a quantity of freſh water, ſo as to render it quite full, it was again inverted in the jar, and removed into a dark room ſurrounded with ſix lamps and reflectors; ſix wax candles were alſo placed at different diſtances from three to ſix inches from it, and diſpoſed in ſuch a manner as to throw the greateſt quantity of light poſſible upon the ſilk, taking care at the ſame time that the water ſhould not acquire a greater heat than 90°. In this ſituation the ſilk began to be covered with air-bubbles in about ten minutes; and in ſix hours as much was collected as could be proved by nitrous air, when it was found to be very pure. A freſh-gathered, healthy leaf of a peach tree, and a ſtem of the pea-plant with three leaves upon it, furniſhed air by expoſure to the ſame light, but in ſmaller quantities than by the action of the ſolar rays. The air produced in the dark, in whatever manner procured, was always in too ſmall quantity to be meaſured.

In making theſe experiments, as it was found ſomewhat troubleſome to invert the globes in water, they were at laſt only kept in an inclined poſture on the table, as repreſented in Plate VIII. fig. 1. the air collecting itſelf in the upper part of the belly. Having provided himſelf with a number of globes of different ſizes, he then proceeded in his experiments in the following manner.

45 Various ſubſtances ſubſtituted for raw ſilk.

Finding that raw ſilk, expoſed to the action of light, produced ſo great a quantity of air, he was induced to try whether ſome other ſubſtances might not be found out capable of doing the ſame. Having therefore provided ſix globes of $4\frac{1}{2}$ inches in diameter, and filled them with ſpring water, he introduced into each of them 15 grains of one of the following ſubſtances, *viz.* ſheep's wool, eider-down, fur of a Ruſſian hare, cotton wool, lint or the ravelings of linen yarn, and human hair.—The reſults of theſe experiments were, 1. The globe containing the ſheep's wool began to yield air in three days; but ſeveral days of cloudy weather intervening, he did not remove it for ſome time, when only $1\frac{1}{4}$ths of an inch of air was collected, which proved very pure when tried with nitrous air; but the wool, even in the moſt favourable circumſtances, never afforded more than one third of the quantity which would have been yielded by ſilk. 2. The water with the eider-down began to furniſh air almoſt immediately, and continued to do ſo in quantities little leſs than had been furniſhed by the ſilk, and nearly of the ſame quality. One cubic inch and three quarters of this air, furniſhed the eighth day from the beginning of the experiment, with three meaſures of nitrous air, was reduced to 1.34. 3. The fur of the hare produced more air than the wool, but leſs than the eider-down. Two cubic inches of air were collected in four days; which made its appearauce in a different manner from that of the other ſubſtances, the air-bubbles being at conſiderable diſtances from one another, and growing to an uncommon ſize before they detached themſelves from the fur. The cotton yielded a conſiderable quantity of air of a better quality than any of the former. The ravelings of linen were very ſlow in furniſhing air, and produced but a ſmall quantity; only two cubic inches being collected in the ſpace of a fortnight. This ſubſtance appeared to be the very reverſe of the hare's fur; for the air, inſtead of attaching and collecting itſelf about the ſubſtance in large bubbles, ſcarce ever made its appearance in ſufficient quantity to raiſe it to the top of the water. The human hair furniſhed ſtill leſs than the linen, and the produce was of inferior quality, though ſtill ſuperior to the common atmoſphere.

In order to diſcover the comparative fineneſs of air produced from vegetables and from raw ſilk, a ſmall quantity of air from the ſtem of a pea-plant, which had four healthy leaves upon it, was proved with nitrous air, and found greatly inferior to that from raw ſilk and ſeveral of the ſubſtances already mentioned. An entire plant of houſewort, of a moderate ſize, furniſhed only $\frac{1}{4}$ths of a cubic inch of air in ſeven hours, and that greatly inferior to common air; but the leaves alone afforded a much greater quantity, and of a quality greatly ſuperior.

46 Of the quantity of air procured by means of theſe ſubſtances from water.

Having proceeded thus far, it was next determined to aſcertain how much air a given quantity of water would yield by expoſure to the ſun's rays. For this purpoſe, a globe of fine white, clear, and very thin glaſs, containing 296 inches, being filled with freſh ſpring water, and 30 grains of raw ſilk immerſed in it, was expoſed to the air for three days in the month of May, but for the moſt part cold and cloudy. During this time only $9\frac{1}{2}$ inches of air were produced; but next day, by expoſure to the ſun from nine in the morning till five in the afternoon, the weather being very fine, 8.46 inches more were produced. The water had now aſſumed a light greeniſh colour. Next day, the product of air was nine cubic inches, of a better quality; and the day following, ſix inches ſtill ſuperior,

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ſuperior, though expoſed only for three hours and an half; but the next day, it being cold and cloudy, only $\frac{3}{4}$ths of an inch of air were produced, and theſe manifeſtly inferior to the foregoing. No more air could afterwards be procured, excepting one quarter of a cubic inch; ſo that from 296 inches of this water, 33.96 of air were obtained.

In this experiment the air produced was every day removed from the globe, and its place ſupplied with water: the following were made, to determine what alteration would take place on allowing the quantity of air produced to remain from firſt to laſt. The globe being therefore filled again, and the ſilk well waſhed and replaced in it, the quantity of air produced amounted in four days to 30.1 cubic inches; and would probably have been more conſiderable, had not the globe been unable to contain it along with the water, and therefore there was a neceſſity for putting an end to the experiment. The quality was ſuperior to the former.—In this experiment the water had loſt its tranſparency, and acquired a greeniſh caſt; a quantity of yellowiſh earth was precipitated to the bottom, and attached itſelf ſo ſtrongly to the glaſs, that it could not be removed without great difficulty.

On varying the experiment, by employing unwaſhed raw ſilk, it was found, that 17 grains of it in 20 cubic inches of water, produced, for the firſt four days, air of a worſe quality than the atmoſphere; but afterwards yielded near two inches of a ſuperior quality. The quantity of this air was ſuperior to that in other experiments, though its quality was ſomewhat inferior.

In reflecting on the experiments above related, it occurred to Sir Benjamin, that the cotton-like ſubſtance produced by the *populus nigra*, a ſpecies of poplar tree, might be a proper ſubſtitute for the raw ſilk; eſpecially as he recollected, that on rendering it very dry for ſome other purpoſe, ſome parcels of it had quitted the plate on which they were laid, and mounted up to the top of the room. An hundred and twenty grains of this ſubſtance were therefore put into the large globe containing 296 inches; but after expoſure to the ſun for ſome hours, the air produced, in quantity about $1\frac{3}{4}$ths of a cubic inch, was found to be little better than phlogiſticated air. In three days after, only one cubic inch was formed; and this appeared to be completely phlogiſticated. Next day, only a few inconſiderable air-bubbles appeared; but, the day following, the water ſuddenly changed to a greeniſh colour, and began all at once to give good air, and in great abundance. This day 10.42 cubic inches were produced, and the next 14.34. The ſame water continued to furniſh air for four days longer; the whole quantity amounting to $44\frac{1}{4}$ cubic inches, the quality of which was ſuperior to that of the air produced in former experiments.

47 Of the cauſe of this production of air.

In ſpeculating on the cauſe of this production of air, it occurred to our author, that perhaps the quantity of it might be in proportion to the ſurfaces of both. In order to aſcertain this, he viewed an hair of ſilk, and another of poplar-cotton, through a good microſcope, when the former appeared twice the diameter of the latter. The ſpecific gravity of the cotton was found to be nearly equivalent to that of water; and, by a comparative view of the two through a microſcope, the ſurfaces appeared to be as 1000 to 3468. By proceeding in this calculation, it appeared that the ſurface of 30 grains of the cotton could not be leſs than 6600 ſquare inches, while that of a like quantity of the ſilk amounted to no more than 476. Hence it evidently appeared, that the produce of air from the two ſubſtances was neither in proportion to their weights nor their ſurfaces. It appeared alſo, that the quality of the air produced at firſt was conſiderably inferior to that yielded ſome time afterwards. In order to aſcertain the times at which air of the beſt quality was produced, &c. the following experiments were made:

48 At what times air of the beſt quality is produced.

1. A globe, containing 46 cubic inches, being filled with water, and 30 grains of raw ſilk, well waſhed, and freed from the remains of former experiments, put into it, yielded in a cold and cloudy day only $\frac{1}{4}$th of a cubic inch of air: the two following days it yielded $3\frac{1}{2}$ cubic inches, the quality of which was ſuperior to that of the former in the proportion of 296 to 114 (A). 2. The globe being filled again with water, in two other days when the ſunſhine was leſs powerful, the quality was 197, and the quantity $1\frac{1}{8}$th; but afterwards, when the weather became fine, the quantity was again 3.8 inches, and quality 342. 3. The globe being again filled with water, and expoſed to the ſun for two days, yielded 2.2 inches of air, of a quality equal to 233. 4. A ſimilar globe, with poplar-cotton which had been uſed in former experiments, gave 2.53 inches, of a quality 280. 5. A ſmall globe of 20 inches, with 17 grains of raw ſilk, gave one cubic inch of air, of the quality 263. 6. A large globe of 296 inches, filled with freſh water, and a ſmall quantity of *conferva rivularis*, gave $1\frac{1}{4}$ cubic inch, of the quality only of 124. The water was changed to a brown colour. 7. On repeating the experiment with a ſmall handful of the conferva, 13.14 cubic inches of air were produced, of the quality 246. The water was very faintly tinged, towards the end of the experiment, of a greeniſh caſt. 8. The globe of 46 inches, with 30 grains of raw ſilk uſed in many former experiments, produced in two days 1.6 cubic inches of air, of the quality 204. 9. A globe of equal capacity, with 15 grains of poplar-cotton, produced in the ſame time 1.28 inches, of the quality 260. In both theſe experiments, the water had acquired a faint greeniſh caſt; but the colour of that with the cotton was deepeſt. On examining this water with a microſcope, it was found to contain a great number of animalcules exceedingly ſmall, and nearly of an oval figure; that with the ſilk contained them likewiſe, but not in ſuch numbers: however, our author aſſures us, that in all caſes in which the water acquired a greeniſh hue, he never failed to find them; and thinks, that from their preſence alone, the colour of the water in the firſt inſtance univerſally aroſe.

49 Experiment with ſpun glaſs.

As Sir Benjamin was now more than ever embarraſſed with reſpect to the ſhare the ſilk and other bodies employed in theſe experiments had in producing the air, he made the following experiment to determine the matter: "Concluding (ſays he), that if ſilk and other bodies,

(A) In all theſe experiments, the quality of atmoſpheric air is ſuppoſed to be 100.

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bodies, used in the foregoing experiments, actually did not contribute any thing, considered as chemical substances, in the process of the production of pure air yielded by water; but if, on the contrary, they acted merely as a mechanical aid in its *separation* from the water, by affording a convenient surface for the air to attach itself to; in this case, any other body having a large surface, and attracting air in water, might be made use of instead of the silk in the experiment, and pure air would be furnished, though the body should be totally incapable of communicating any thing whatever to the water."

With a view to ascertain this, the large globe being made perfectly clean, and filled with spring-water, he introduced into it a quantity of the fine thread of glass commonly called *spun-glass*, such as is used for making a brush for cleaning jewels, and an artificial feather sold by Jew pedlars. The result of the experiment was, that the globe being exposed in the sun, air-bubbles began almost instantly to make their appearance on the surface, and in four hours 0.77 of a cubic inch of air was procured, which, with nitrous air, showed a quality of 88; after which, not a single globule more was produced, though the globe was exposed for a whole week in fine sunshine weather. Hence it appears, that something more than mere surface was wanted to produce dephlogisticated air from water by means of the sun's light.

50 Of the quantity and quality of air produced from water alone.

The following experiments were made with a view to determine the quantity and quality of air produced by means of the heat and light of the sun from water alone. A large jar of clear glass, containing 455 cubic inches, being washed very clean, was filled with fresh spring water, inverted in a glass bason of the same, and exposed to the weather for 28 days. At the same time, another similar jar was filled with water taken from a pond in a garden in which many aquatic plants were growing, and exposed in the same place, and during the same period. The latter began to yield air in pretty large quantities on the third day, and continued to do so till the 14th; the former yielded little or none till the 14th, when it began to emit air, and continued to do so till the 22d. On removing the air produced, that from the spring-water was 14 inches in quantity, and 138 in quality; but from the pond water, $31\frac{1}{2}$ in quantity, and 252 in quality. The colour of the waters was not changed; but both of them had deposited a considerable quantity of earth, which was found adhering to the surfaces of the glass basons in which the jars were inverted. As these basons, however, were very thick, and consequently had but little transparency, the sediment of the water was in a great measure deprived of the benefit of the sun's light; the experiment was therefore repeated with the following variation: In a large cylindrical jar of very fine transparent glass, 10 inches in diameter and 12 inches high, filled with spring-water, a conical jar, $9\frac{1}{4}$ inches in diameter at the bottom, and containing 344 inches, was inverted, and the whole exposed to the sun for 21 days. Little air was furnished till the 7th day, when the liquor assumed a greenish cast, and a fine slimy sediment of the same colour, the green matter of Dr Priestley, beginning to be formed on the bottom, air was generated in abundance, and was furnished in pretty large quantities till the 18th, when it entirely ceased. The whole amounted to 40 cubic inches, and the quality 213.

51 Dr Ingenhousz's theory contested.

These are the principal experiments contained in Sir Benjamin Thompson's letter to Sir Joseph Banks. In his postscript he observes, that as he never was thoroughly satisfied with the opinion of Dr Ingenhousz, that the dephlogisticated air was *elaborated* in the vessels of the plant, he found his doubts rather confirmed than diminished by the experiments above related. "That the fresh leaves of certain vegetables (says he), exposed in water to the action of the sun's rays, cause a certain quantity of pure air to be produced, is a fact which has been put beyond all doubt: but it does not appear to me by any means so clearly proved, that this air is '*elaborated* in the plant by the powers of vegetation,—phlogisticated or fixed air being received by the plant as food, and the dephlogisticated air rejected as an excrement:' for besides that many other substances, and in which no elaboration or circulation can possibly be supposed to take place, cause the water in which they are exposed to the action of the light to yield dephlogisticated air as well as plants, and even in much greater quantities, and of a more eminent quality; the circumstances of the leaves of a vegetable, which, accustomed to grow in air, are separated from its stem and confined in water, are so unnatural, that I cannot conceive that they can perform the same functions in such different situations.

"Among many facts which have been brought in support of the received opinion of the elaboration of air in the vessels of plants, there is one upon which great stress is laid, which, I think, requires further examination. The fresh healthy leaves of vegetables, separated from the plant, and exposed in water to the action of the sun's rays, appear, by all the experiments which have hitherto been made, to furnish air only for a short time. After a day or two, the leaves, changing colour, cease to yield air. This has been conceived to arise from the powers of vegetation being destroyed, or, in other words, the death of the plant: and from hence it has been inferred, with some degree of plausibility, not only that the leaves actually retained their vegetative powers for some time after they were separated from their stock; but that it was in consequence of the exertion of those powers, that the air yielded in the experiment was produced.

52 Leaves of plants resume their property of emitting air, after seeming to have lost it.

"But I have found, that though the leaves, exposed in water to the action of light, actually do cease to furnish air after a certain time, yet that they *regain* this power after a short interval, when they furnish (or rather cause the water to furnish) more and better air than at first; which can hardly be accounted for upon the supposition that the air is elaborated in the vessels of the plant."

In confirmation of this doctrine, the globe of 46 inches was filled with fresh spring-water, and two peach-leaves were exposed for 10 days to the sun. In four days the water seemed to be entirely exhausted; but, next day, the water acquired a greenish colour, and again produced air pretty plentifully, which appeared in bubbles on the leaves; and on the 6th day, 0.34 of a cubic inch of air was produced, of the quality 232. Next day it yielded $\frac{2}{10}$ths of a cubic inch, of the quality 297. The three succeeding days it yielded $1\frac{1}{4}$ inches, the quality 307; after which an end was put to the experiment.—

Dephlogisticated Air. riment.—On making other trials with leaves immersed in water already green and prepared to yield dephlogisticated air, it was found that they produced air in great quantity: but our author is of opinion, that all the appearances may be solved, by supposing that the air was produced in the mass of water by the green matter; and that the leaves, silk, &c. did no more than assist it in making its escape, by affording a convenient surface to which it could attach itself, in order to collect together and assume its elastic form.

Thus we see, that nature is provided with abundant resources for the supplying of this pure part of the atmosphere which is subject to such continual waste; and there is not the least doubt, that in a great number of cases the light of the sun produces pure air from water as well as from vegetables. It is probable, also, that even the waters of the ocean contribute towards this salutary purpose; as Dr Dobson of Liverpool found, that sea-water contained air superior in quality to that of the atmosphere. The purification of atmospherical air by agitating it in water, will be considered in a subsequent section.

53 Pure air found in sea-water.

54 How to procure pure air in large quantity.

As dephlogisticated air is found to support animal life for a much longer time than common air, it has been supposed that it might answer valuable purposes in medicine, provided any cheap method of procuring it in large quantities could be fallen upon. With this view, Mr Cavallo proposes to distil it from nitre with a strong heat; but the experiments already related certainly point out an easier method, free from the expence and trouble which must necessarily attend every chemical operation of this kind.

§ 2. *Properties of Dephlogisticated Air.*—This kind of air possesses some of the properties of common air in a very eminent degree, but is deficient in others. Those in which it excels, are the support of flame and of animal life. It is equally elastic, or rather more so, than common air; as it likewise exceeds it a little in specific gravity, the proportion betwixt it and common air being that of 160 to 152. On introducing a lighted candle into dephlogisticated air, the flame not only grows larger, but becomes exceedingly bright; and when the air is very pure, the candle burns with a crackling noise, as if the air contained some combustible matter, at the same time that the wax or tallow wastes surprisingly fast.

55 Dephlogisticated air produces intense heat.

The heat of the flame is in proportion to its light. If we fill a bladder with dephlogisticated air, and then fasten to its neck a glass tube whose aperture is drawn to a fine point, the dephlogisticated air, if driven out by pressing the bladder, will augment the heat of a candle to such a degree, that if any small bits of metal, placed on a piece of charcoal, be held in the apex of the flame, they will almost instantly be melted. Even grains of platina may by this means be melted; and in a larger fire there is no doubt that the effects of burning mirrors might be equalled.

56 Explodes violently with inflammable air.

On mixing dephlogisticated and inflammable air together, an explosion takes place as on mixing common and inflammable air, but with much greater violence. If an ounce vial, which for this purpose should be very strong, be filled with a little more than one-third of dephlogisticated and the rest inflammable air, and the flame of a candle presented to its mouth, it will explode nearly as loud as a small pistol.

Dephlogisticated Air.

All phlogistic processes are promoted much better by dephlogisticated than common air. Dr Priestley put a quantity of pyrophorus into one of the small jars used for making experiments upon air in quicksilver; then filling up the vessel with that fluid, he inverted it in a bason of the same, and threw in dephlogisticated air at different times. It always occasioned a sudden and vehement accension, like the flashing of gun-powder, and the air was greatly diminished.

57 Burns vehemently with pyrophorus.

58 Common air is not diminished by burning.

It has been, almost throughout all ages, believed, that combustion in every instance diminished common air, or reduced it to a smaller volume: but the late experiments of Mr Lavoisier have shown, that this is a mistake; and that in ordinary processes attended with the production of fixed and phlogisticated air, the quantity of vapour produced is equivalent to that absorbed, or otherwise made to disappear during the operation. With dephlogisticated air the case is very different. Mr Lavoisier having introduced a burning candle into a glass jar filled with very pure air obtained from calcined mercury, a great heat took place; which at first expelled a small quanity of the air; but afterwards, when the candle was extinguished, it was found that two-thirds of the bulk of air employed had been converted into fixed air, or a quantity of this kind of air equivalent to the former had been produced. The remainder, after taking up the fixed air by caustic alkali, was still as pure as before. In the common processes, he observes, that not more than one-tenth of the air employed is converted into fixed air. In this experiment, the superior gravity of fixed air, and the consequent condensation of the other, must undoubtedly have produced some diminution in the volume of air, though Mr Lavoisier does not take notice of it. In other cases, however, the diminution is much more perceptible. Mr Scheele having introduced some live coals into a matrass filled with dephlogisticated air, found that it was diminished by one-fourth of its quantity. Repeating the experiment with sulphur, the flame became larger and more vivid than in common air, and three-fourths of its quantity were lost. Putting a piece of phosphorus into seven ounce-measures of this kind of air, stopping the mouth of the bottle with a cork, and setting fire to the phosphorus within it, the vial broke in pieces, as soon as the flame was extinguished, by the pressure of the external air. Repeating the experiment with a stronger vial, and opening it afterwards under water, the fluid rushed into it in such a manner as almost to fill it entirely. This extraordinary diminution was also perceived on setting fire to inflammable air in the dephlogisticated kind. The way in which he accomplished this was, by filling a matrass with dephlogisticated air, and inverting it over a phial containing an effervescing mixture of vitriolic acid and iron-filings plunged into a vessel of hot water, and furnished with a slender tube reaching above the surface of the vessel, as represented Plate VIII. fig. 2. The inflammable air issuing from the orifice of the small tube, was set on fire previous to the inversion of the matrass, and the mouth of the latter immersed in the water; on which that fluid soon began to rise, and continued to do so till seven-eighths of the vessel were full. In cases of slow combustion, where common air is diminished and phlogisticated, the dephlogisticated kind was found to be almost entirely

59 But dephlogisticated air suffers diminution.

Dephlogisticated Air.

tirely destroyed. A phial, containing 20 ounce measures of dephlogisticated air, and inverted into a solution of hepar sulphuris, was entirely filled with the latter in the space of two days.

60
Phenomena of dephlogisticated with nitrous air.

The purity of dephlogisticated air is ascertained by its degree of diminution with nitrous air; which, like that of the diminution by liver of sulphur, or otherwise, is to be considered as a phlogistic process, or kind of burning, especially as a considerable degree of heat is thereby generated. Very great differences are perceived in this respect; and according to the quantity of diminution, the air is said to be two, three, or four times better than common air. It is not yet accurately determined how far this proportionable purity extends. Dr Priestley mentions some extracted from red lead five times as pure as common air. Another quantity, produced from a solution of mercury in nitrous acid, was so pure, that one measure of it mixed with two of nitrous air, which had been obtained in the first part of the same process, occupied only 0.03 of a measure. "Repeating the experiment (says he), I found, that two measures of nitrous air were rather more than sufficient to saturate one measure of the dephlogisticated air; so that possibly, had the former experiment been made with more circumspection, the diminution, extraordinary as it was, would have been somewhat greater. Indeed it cannot be supposed, that exactly two measures of nitrous air should be the precise quantity that would afford the greatest diminution. It should also be considered, that a small portion of air might be yielded by the water in which the experiments were made. Upon the whole, therefore, I am inclined to think, that, were it possible to make both the dephlogisticated and nitrous air in the greatest purity, and then to mix them in some exact proportion, the aërial form of them both would be destroyed, the whole quantity seeming to disappear, as in the mixture of alkaline and acid air."

61
How dephlogisticated air may be contaminated.

Notwithstanding this great degree of purity, the best dephlogisticated air is capable of being contaminated by some of the processes which affect the common air of our atmosphere. Dr Priestley having introduced a quantity of very dry, clean nails, into a receiver filled with dephlogisticated air, and inverted it in quicksilver, found, that about nine months after, one-tenth of the whole quantity had disappeared, tho' he could not perceive any rust upon the nails. The effects of combustion have already been related, viz. as producing a great quantity of pure fixed air; but putrefaction and animal respiration probably contaminate it in a manner similar to that of atmospherical air, though few or no experiments seem to have been made on this subject. Mr Cavallo, however, informs us, that "when an animal is confined in a quantity of dephlogisticated air, and is kept therein till it dies, that air is not rendered so bad but that it will still be capable of considerable diminution by nitrous air. This seems to show, that dephlogisticated air is somewhat different from pure common air; or that common air is originally different from dephlogisticated air, lowered by the addition of phlogiston. The phenomenon is certainly very remarkable; and sometimes a quantity of dephlogisticated air, after having been breathed by an animal till it died, will appear by the nitrous test to be even better than common air. When the experiment is performed over lime-water (to absorb the fixed air produced in respiration), the diminution by a mixture of nitrous air is less than it would otherwise be; but it is still diminished much more than common air after an animal has died in it; which seems to intimate, that the death of the animal in dephlogisticated air is principally owing to the fixed air formed by the act of respiration. It may be said, that the inflammable principle discharged through the lungs of an animal, being perhaps combined with some other principle, requires a longer time to combine with the dephlogisticated air than the phlogiston of nitrous air; but this is only an hypothetical explanation of the abovementioned remarkable phenomenon, which requires many direct proofs."

62
Vegetation ill supported by dephlogisticated air.

Dephlogisticated air is much inferior to that of the common atmosphere in supporting vegetable life. This has been ascertained by the experiments of Dr Priestley, Mr Fontana, Mr Scheele, Dr Ingenhousz, &c. Dr Priestley took three sprigs of mint, and having put all the roots into vials containing the same pump-water which had been for some time exposed to the atmosphere, introduced one of them into a jar of dephlogisticated air, another into a jar of common air, and a third into that which had been phlogisticated with nitrous air several months before, and in such a state, that one measure of it, and one of nitrous air, occupied the space of $1\frac{1}{4}$ measures. This was done in April; and on examining them on the 12th of May following, it was found, that the plant in phlogisticated air had grown remarbably, much better than that in common air; while the plant in dephlogisticated air had a very sickly appearance. Examining them on the 26th of the same month, the appearance continued nearly as before; but it was now found, that though the plant in phlogisticated air had grown so well, the air was not sensibly improved by it, though the dephlogisticated air was injured by the plant which grew in it.

63
Dr Priestley's first hypothesis.

§ 3. *Of the Composition of Dephlogisticated Air.*—When Dr Priestley first discovered the existence of this fluid, having found that it was always procured by means of earthy substances; and that as it came over, the bubbles appeared full of fine white powder; he concluded, that it is composed of the nitrous acid and earth, with as much phlogiston as is necessary to its elasticity; and that the common atmosphere has as much more as is necessary to bring it into the mean condition in which we find it. It was not long, however, before this theory met with opposition. Dr Priestley himself, though induced, from the waste of the solid matter used in his experiments, to conclude that the air contained some quantity of earth, was nevertheless unable, by any method he could think of, to ascertain that quantity. His experiments were opposed by others made by Lavoisier; who insisted, that when solution of mercury was carefully distilled, the metal was obtained in full quantity, or with scarce any loss, notwithstanding the dephlogisticated air produced. This gentleman having put two ounces and one drachm of mercury into red precipitate, and afterwards revived it, lost a very few grains of the metal; which, he says, might be the weight of a little red matter that was found adhering to the neck of the vessel. The same thing was observed by Mr Fontana, who repeated the experiment often with less than a

64
Difference betwixt Dr Priestley, Mr Lavoisier, &c.

Dephlogisticated Air. grain weight of loss. The vessel he used had a neck of about two feet long: and he particularly remarks, that, in order to succeed in this experiment, the fire should be managed with very great dexterity; for if that be too strong, part of the precipitate will be volatilized, and then the result of the experiment is precarious.

These experiments were opposed by others made by Dr Priestley, who in several trials found that a considerable quantity of the metal was always lost. In one of these experiments, out of 11 pennyweights 10 grains of mercury, the loss amounted to one pennyweight two grains. In another experiment, 88 grains were lost, out of a quantity of red precipitate, in the preparation of which half an ounce of mercury had been employed. The quantity of mercury lost in his experiments, or rather the proportion of it to that of the metal employed, was always various, and the difference not very small; whence Mr Cavallo and others, with great appearance of reason, conclude, that the true reason of any perceptible loss was the strong heat made use of in the distillation, and consequently that there is no reason to suppose that any earth exists in dephlogisticated air.

65 Earth cannot be proved to exist in dephlogisticated air.

The next question was, Whether any of the nitrous acid existed in dephlogisticated air? That it contains none in a proper state of acidity, is indeed evident from many decisive experiments; but an idea was naturally entertained, that in the formation of dephlogisticated air the nitrous acid was decomposed, and part of it entered into the composition of the aerial fluid. This gave rise to the theories of Mr Lavoisier and Mr Kirwan, which are noticed under the article ACID; as also the experiments of Mr Watt, which tended to show that no nitrous acid was destroyed in the composition of dephlogisticated air. To these Mr Kirwan replied in the manner related in that article. We shall here, however, give a quotation from Dr Priestley as a kind of addition to Mr Watt's testimony on this head, so that the reader may be the better able to determine the weight of the evidence on both sides.

66 Whether the nitrous acid enters its composition.

"At Mr Watt's request (says he), I endeavoured to ascertain the quantity of acid that was expelled from nitre, in procuring the dephlogisticated air from it. To do this, I put two ounces of purified nitre into a glass retort, and receiving the air in 300 ounce measures of water, only filled each recipient half full, and agitated the air very much in the water, in order to make the fluid imbibe as much as possible of the acid it contained. Notwithstanding this agitation, however, every vessel of the air retained a strong smell of the acid. The moment the air ceased to come, I filled a large phial with the water, and carried it to Mr Watt, who carefully examined it; and in a paper which he presented to the Royal Society, and which is published in the Philosophical Transactions, he has given an account of the quantity of acid that was contained in all the 300 ounces of water: whence it may be fairly inferred, that there was no occasion to suppose that any of the acid entered into the composition of the air; but that it was all either rendered volatile or retained in the water." On the other hand, the Abbé Fontana informs us, that, in distilling an ounce of nitre with a strong heat, in order to expel dephlogisticated air from it, only a few grains of weak nitrous acid are obtained, more or less as the fire applied is weak or strong: but that the quantity of dephlogisticated air extricated from it follows the contrary rule; being greatest when the heat is most violent and suddenly applied, and less when the fire is gradually applied. Dephlogisticated Air.

67 Dephlogisticated air imbibed by calces of metals.

On calcining metals in dephlogisticated air, very singular phenomena are observed, which seem to throw great light upon the composition of this fluid. "One of the most simple of all phlogistic processes (says Dr Priestley), is that in which metals are melted in dephlogisticated air. I therefore began with this, with a view to ascertain whether any water be produced when the air is made to disappear in it. Accordingly, into a glass vessel, containing seven ounce-measures of pretty pure dephlogisticated air, I introduced a quantity of iron turnings, which is iron in thin small pieces, exceedingly convenient for these and many other experiments, having previously made them, together with the vessel, the air, and the mercury by which it was confined, as dry as I possibly could. Also to prevent the air from imbibing any moisture, I received it immediately in the vessel in which the experiment was made, from the process of procuring it from red precipitate, so that it had never been in contact with any water. I then fired the iron by means of a burning lens, and presently reduced the seven ounce-measures to 0.65 of a measure; but I found no more water after this process than I imagined it had not been possible for me to exclude, as it bore no proportion to the air which had disappeared. Examining the residuum of the air, I found one-fifth of it to be fixed air; and when I tried the purity of that which remained by the test of nitrous air, it did not appear that any phlogisticated air had been produced in the process: for though it was more impure than I suppose the air with which I began the experiment must have been, it was not more so than the phlogisticated air of the seven ounce-measures, which had not been affected by the process, and which must have been contained in the residuum, would necessarily make it. In this case, one measure of this residuum, and two of nitrous air, occupied the space of 0.32 of a measure. In another experiment of this kind, ten ounce-measures of dephlogisticated air were reduced to 0.8 of a measure, and by washing in lime-water to 0.38 of a measure. In another experiment, 7$\frac{1}{2}$ ounce-measures of dephlogisticated air were reduced to half an ounce-measure, of which one-fifth was fixed air, and the residuum was quite as pure as the air with which I began the experiment; the test with nitrous air, in the proportions above mentioned, giving 0.4 in both cases.

"In these experiments the fixed air must, I presume, have been formed by the union of the phlogiston from the iron and dephlogisticated air in which it was ignited; but the quantity of it was very small in proportion to the air which had disappeared; and at that time I had no suspicion that the iron, which had been melted and gathered into round balls, could have imbibed it; a melting heat having been sufficient, as I had imagined, to expel every thing that was capable of assuming the form of air from any substance whatever. Sensible, however, that such a quantity of air must have been imbibed by *something*, to which it must have given a very perceptible addition of weight, and

seeing

seeing nothing else that could have imbibed it, it occurred to me to weigh the calx into which the iron

68 Dephlogisticated air imbibed by iron.

had been reduced; and I presently found, that the dephlogisticated air had actually been imbibed by the melted iron, in the same manner as inflammable air had been imbibed by the melted calces of metals in my former experiments, however improbable such an absorption might have appeared *à priori*. In the first instance, about twelve ounce-measures of dephlogisticated air had disappeared, and the iron had gained six grains in weight. Repeating the experiment very frequently, I always found that other quantities of iron, treated in the same manner, gained similar additions of weight, which was always very nearly that of the air which had disappeared.

69 Is capable of taking it up from the atmosphere.

"Concluding from the preceding experiments, that iron, sufficiently heated, was incapable of saturating itself with pure air from the atmosphere, I then proceeded to melt it with the heat of a burning lens in the open air; and I presently found, that perfect iron was easily capable of being fused in this way, and continued in this fusion a certain time, exhibiting the appearance of *boiling* or throwing out air; whereas it was, on the contrary, imbibing air; and, when it was saturated, the fusion ceased, and the heat of the lens could make no farther impression upon it. When this was the case, I always found that it had gained weight in the proportion of $7\frac{1}{2}$ to 24, which is very nearly one-third of the original weight. The same was the effect when I melted steel in the same circumstances, and also every kind of iron on which the experiment could be tried. But I have reason to think, that with a greater degree of heat than I could apply, the iron might have been kept in a state of fusion somewhat longer, and by that means have imbibed more than even one-third of its original weight.

70 Remarkable phenomenon attending the melting of cast-iron.

"There was a peculiar circumstance attending the melting of cast iron with a burning lens, which rendered it impossible to ascertain the addition that was made to its weight, and at the same time afforded an amusing spectacle: for the moment that any quantity of it was melted, and gathered into a round ball, it began to disperse in a thousand directions, exhibiting the appearance of a most beautiful fire-work; some of the particles flying to the distance of half a yard from the place of fusion; and the whole was attended with a considerable hissing noise. Some of the largest pieces, which had been dispersed in this manner, I was able to collect, and having subjected them to the heat of the lens, they exhibited the same appearance as the larger mass from which they had been scattered.

"When this cast iron was melted in the bottom of a deep glass receiver, in order to collect all the particles that were dispersed, they firmly adhered to the glass, melting it superficially, though without making it crack, so that it was still impossible to collect and weigh them. However, I generally found, that, notwithstanding the copious dispersion, what remained after the experiment rather exceeded than fell short of the original weight of the iron."

71 Formation of water from dephlogisticated and inflammable air.

On attempting to revive this calx of iron in inflammable air, a very new and unexpected appearance took place. Having put a piece of iron saturated with pure air into a vessel filled with inflammable air confined by water, the inflammable air disappeared and the metal was revived; but on weighing it, he found that $2\frac{1}{2}$ grains out of $11\frac{1}{2}$ had been lost, besides the $7\frac{1}{2}$ ounce-measures of inflammable air which had vanished. Considering all these circumstances, the Doctor had now no doubt that the two kinds of air had united and formed either fixed air or water; and with a view to determine this point, he repeated the experiment in a vessel where the inflammable was confined by mercury, both the vessel and mercury having been previously made as dry as possible. In these circumstances he had no sooner begun to heat the iron, than the air was perceived to diminish, and at the same time the inside of the vessel to become cloudy, with particles of dew that covered almost the whole of it. These particles by degrees gathered into drops, and ran down in all places, excepting those which were heated by the sun-beams. On collecting the water produced in this experiment, by means of a piece of filtering paper carefully introduced to absorb it, he found it to be as nearly as possible of the same weight with that which had been lost by the iron; and also in every experiment of this kind, in which he attended to the circumstance, 72
he found that the quantity of inflammable air which had disappeared was about double that of the dephlogisticated air set loose in the operation, supposing that weight to have been reduced into air. Thus, at one time, a piece of this slag absorbed $5\frac{1}{2}$ ounce measures of inflammable air, while it lost the weight of about three ounce-measures of dephlogisticated air, and the water collected weighed two grains. Another time a piece of slag lost 1.5 grains, and the water produced was 1.7 grains. In a third case, where $6\frac{1}{2}$ ounce-measures of inflammable air were reduced to 0.92 of a measure, the iron had lost the weight of 3.3 ounce-measures of dephlogisticated air, or nearly two grains.

Quantity produced in this manner.

73 Experiments with copper, &c.

The Doctor having succeeded so well with iron, next tried the calx of copper, or those scales which fly off from it by hammering whilst it is red-hot; and found water produced in the inflammable air in the same manner as when the scales of iron were used. On using precipitate *per se*, he imagined at first that water was obtained from this substance also; but on repeating the experiment to more advantage, he found no more water than might be supposed to have been contained as an extraneous substance either in the inflammable air or in the red precipitate. With iron, however, the case was vastly different. As the Doctor had formerly satisfied himself that inflammable air always contains a portion of water, and also that when it has been some time confined by water it imbibes more, so as to be increased in its specific gravity by that means, he repeated the experiment with inflammable air which had not been confined by that fluid, but was received in a vessel of dry mercury from the vessel in which it had been generated; but in this case the water was produced, to appearance, as copiously as in the former experiment. "Indeed (says he), the quantity of water produced, so greatly exceeding the weight of all the inflammable air, is sufficient to prove that it must have had some other source than any constituent part of that air, or the whole of it, together with the water contained in it, without taking into consideration the corresponding loss of weight in the iron.

"I must here observe, that the iron slag which I had treated in this manner, and which had thereby lost the

the weight which it had acquired in dephlogifticated air, became perfect iron as at firft, and was then capable of being melted by the burning lens again; fo that the fame piece of iron would ferve for thefe experiments as long as the operator fhould choofe. It was evident, therefore, that if the iron had loft its phlogifton in the preceding fufion, it had acquired it again from the inflammable air which it had abforbed; and I do not fee how the experiment can be accounted for in any other way."

74 Iron may be made to imbibe dephlogifticated air as often as we pleafe.

75 Experiments of Mr Cavendifh, &c. on water.

As thefe experiments of Dr Prieftley tend very much to throw fome light on the compofition of dephlogifticated air, we fhall here give an account of fome others made by Mr Cavendifh, as well as thofe of Dr Prieftley and the French chemifts, upon water: From all which it is concluded by the moft celebrated philofophers and chemifts, That dephlogifticated air is one of the conftituent and elementary parts of water, inflammable air being the other; though the opinion is ftill contefted by fome foreign chemifts.

Phil. Tranf. lxxiv. 125.

"As there feemed great reafon," fays Mr Cavendifh, "to think, from Dr Prieftley's experiments, that the nitrous and vitriolic acids were convertible into dephlogifticated air, I tried whether the dephlogifticated part of common air might not be converted into nitrous or vitriolic acid." For this purpofe he impregnated fome milk of lime with the fumes of burning fulphur, by burning 122 grains of fulphur in a large glafs receiver, in which fome lac calcis was included. No nitrous falt, nor any thing befides felenite, was produced in the procefs. Neither was any nitrous acid produced by phlogifticating common air with liver of fulphur, or by treating dephlogifticated air in the fame manner. The liver of fulphur ufed in thefe experiments was made with lime; and the only obfervation made on this occafion was, that the felenite produced was much more foluble in water than when made with dephlogifticated vitriolic acid.

76 Whether the phlogiftication of air produces vitriolic acid.

To try whether any vitriolic acid was produced by the phlogiftication of air, 50 ounces of diftilled water were impregnated with the fumes produced on mixing 52 ounce-meafures of nitrous air with a quantity of common air fufficient to decompound it. This was done by filling a bottle with fome of this water, and inverting it into a bafon of the fame; and then by a fyphon, letting in as much nitrous air as filled it half full; after which, common air was added flowly by the fame fyphon, till the nitrous air was decompounded. When this was done, the diftilled water was further impregnated in the fame manner till the whole quantity of nitrous air was employed. The impregnated water was fenfibly acid to the tafte; and on diftillation yielded firft phlogifticated nitrous acid, then water, and laftly a very acid liquor confifting of dephlogifticated nitrous acid. By faturation with falt of tartar, $87\frac{1}{2}$ grains of nitre, without any mixture of vitriolated tartar, or other vitriolic falt, were obtained.

77 Nitrous acid produced from dephlogifticated and inflammable air.

Thefe experiments having proved unfuccefsful, Mr Cavendifh next proceeded to try the effects of exploding dephlogifticated and inflammable air together in clofe veffels. He begins with relating an experiment of Dr Prieftley; in which, it was faid, that on firing a mixture of common and inflammable air by electricity, in a clofe copper veffel holding about three pints, a lofs of weight was always perceived, on an average about two grains, though the veffel was ftopped in fuch a manner that no air could efcape by the explofion. It is alfo related, that on repeating the experiment, in glafs veffels, the infide of the glafs, though clean and dry before, immediately became dewy; which confirmed an opinion he had long entertained, that common air depofites its moifture by phlogiftication. The experiment, however, did not fucceed with Mr Cavendifh, at leaft with regard to the lofs of weight; which never exceeded the fifth part of a grain, and commonly was nothing at all. In thefe experiments the greateft care was taken to obferve with accuracy the diminution of air by the explofion, and quality of the remainder; from which it appeared, that 423 meafures of inflammable air were nearly fufficient to phlogifticate 1000 of common air, and that the bulk of air remaining after the explofion is very little more than four-fifths of the common air employed; whence he concludes, that "when they are mixed in this proportion, almoft all the inflammable, and about one-fifth of the common air, lofe their elafticity, and are condenfed into the dew which lines the glafs."

78 Quantity of inflammable air neceffary to phlogifticate common air.

To examine more exactly the nature of this dew, 500,000 grain-meafures of inflammable air were burnt with about $2\frac{1}{2}$ times the quantity of common air, and the burnt air was made to pafs through a glafs cylinder eight feet long and three-fourths of an inch in diameter, in order to depofite the dew. The two airs were conveyed flowly into this cylinder by feparate copper pipes, paffing through a brafs plate which ftopped up one end of the cylinder; and as neither inflammable nor common air can burn by themfelves, there was no danger of the flame fpreading to the magazines from which they were conveyed. Each of thefe magazines confifted of a large tin veffel inverted into another juft big enough to receive it. The inner veffel communicated with the copper pipe, and the air was forced out of it by pouring water into the outer veffel; and in order that the quantity of common air expelled fhould be $2\frac{1}{2}$ times that of the inflammable air, the water was let into the outer veffels by two holes in the bottom of the fame tin pan; the hole which conveyed the water into that veffel in which the common air was confined being $2\frac{1}{2}$ times as big as the other. In trying the experiments, the magazines being firft filled with their refpective airs, the glafs cylinder was taken off, and water let by the two holes into the outer veffels, till the airs began to iffue from the ends of the copper pipes; they were then fet on fire by a candle, and the cylinder put on again in its place. By this means upwards of 135 grains of water were left in the cylinder, which had no tafte nor fmell, and which left no perceptible fediment on being evaporated to drynefs; neither did it yield any pungent fmell during the evaporation; in fhort, it feemed pure water. In one of his experiments a little footy matter was perceived, but it was found to proceed from the luting. On repeating the experiment with dephlogifticated, inftead of common air, the produce was nitrous acid.

The following conclufion is drawn by Mr Cavendifh from all thefe experiments: "There feem two ways by which the production of the nitrous acid, in the manner above-mentioned, may be explained: firft, by fuppofing that dephlogifticated air contains a little nitrous acid, which enters into it as one of its component parts;

Dephlogiſticated Air.

parts; and that this acid, when the inflammable air is in ſufficient proportion, unites to the phlogiſton, and is turned into phlogiſticated air, but does not when the inflammable air is in too ſmall proportion: and, ſecondly, by ſuppoſing that there is no nitrous acid mixed with or entering into the compoſition of dephlogiſticated air; but that, when the air is in ſufficient proportion, part of the dephlogiſticated air with which it is debaſed is, by the ſtrong affinity of phlogiſton to dephlogiſticated air, deprived of its phlogiſton, and turned into nitrous acid; whereas, when the dephlogiſticated air, is not more than ſufficient to conſume the inflammable air, none then remains to deprive the phlogiſticated air of its phlogiſton, and turn it into acid.— If the latter explanation be true, I think we muſt allow that dephlogiſticated air is in reality nothing but *dephlogiſticated water*, or water deprived of its phlogiſton; or, in other words, that water conſiſts of dephlogiſticated air united to phlogiſton. On the other hand, if the former explanation be true, we muſt ſuppoſe, that dephlogiſticated air conſiſts of water united to a little nitrous acid, aud deprived of its phlogiſton; but ſtill the nitrous acid in it muſt only make a very ſmall part of the whole, as it is found that the phlogiſticated air into which it is converted is very ſmall in compariſon of the dephlogiſticated air. I think the ſecond of theſe explanations ſeems much the more likely; as it was found that the acid in the condenſed liquor was of the nitrous kind, not only when the dephlogiſticated air was prepared from nitrous acid, but when procured from plants or turbith mineral. Another ſtrong argument in favour of this opinion is, that dephlogiſticated air yields no nitrous acid when phlogiſticated by liver of ſulphur; for if this air contains nitrous acid, and yields it when phlogiſticated by exploſion with inflammable air, it is very extraordinary that it ſhould not do ſo by other means. But what forms a ſtronger, and, I think, almoſt deciſive argument in favour of this explanation, is, that when the dephlogiſticated air is very pure, the condenſed liquor is made much more ſtrongly acid by mixing the air to be exploded with a little phlogiſticated air."

79 Concluſions from theſe experiments.

80 Dr Prieſtley's experiments.

The experiments of Dr Prieſtley alluded to were thoſe in which inflammable air was ſuppoſed by Mr Lavoiſier to be procured from water by paſſing its ſteam through red-hot iron tubes. It was ſoon diſcovered, however, by Dr Prieſtley, that this inflammable air did not proceed from the water, but from the iron of the tube; and might be obtained by tranſmitting aqueous vapour through charcoal or iron placed in tubes of copper, glaſs, or earthen ware, made red-hot, but not through theſe tubes by themſelves. In this caſe, the loſs of the water employed exceeded that of the inflammable air produced in the proportion of 1.3 to 2; and the iron which had thus abſorbed the water, appeared exactly ſimilar to that which had been burned in dephlogiſticated air in the manner already related. His concluſions from thence are theſe: "Since iron gains the ſame addition of weight by being melted in dephlogiſticated air, and alſo by the addition of water when red hot, and becomes, as I have already obſerved, the ſame ſubſtance in all reſpects, it is evident that this air or water, as exiſting in the iron, is the very ſame thing; and this can hardly be explained but on the ſuppoſition that water conſiſts of two kinds of air, viz. inflammable and dephlogiſticated."

81 His opinion concerning the compoſition of water.

Of theſe proceſſes he gives the following explanation: "When iron is heated in dephlogiſticated air, we may ſuppoſe, that, though part of its phlogiſton eſcapes, to enter into the compoſition of the ſmall quantity of fixed air which is then procured, yet enough remains to form water with the dephlogiſticated air which it has imbibed, ſo that this calx conſiſts of the intimate union of the pure earth of iron and of water; and therefore, when the ſame calx, thus ſaturated with water, is expoſed to heat in inflammable air, this air enters into it, deſtroys the attraction between the water and the earth, and revives the iron, while the water is expelled in its proper form."

The whole of the Doctor's opinions on the component parts of this kind of air, however, are ſummed up in the following ſentence in his *Obſervations relating to Theory*.—"The only kind of air that is now thought to be properly elementary, and to conſiſt of a ſimple ſubſtance, is dephlogiſticated air; with the addition at leaſt of the principle of heat, concerning which we know very little; and as it is not probable that this adds any thing to the *weight* of bodies, it can hardly be called an *element* in their compoſition. Dephlogiſticated air appears to be one of the elements of water, of fixed air, of all the acids, and many other ſubſtances, which, till lately, have been thought to be ſimple."

Obſerv. and Exper. vi. 402.

82 Experiments of the French philoſophers.

The experiments of the French philoſophers were of the ſame nature with thoſe of Mr Cavendiſh, but conducted on a larger ſcale. The inference drawn from them was the ſame with that already mentioned, viz. that dephlogiſticated and inflammable air in all caſes are the two conſtituent parts of water. This opinion is adopted by Mr Kirwan in his *Treatiſe on Phlogiſton*. "The experiments of Mr Cavendiſh, and of Mr Monge," ſays he, "appear to me to leave no room to doubt, that when very pure dephlogiſticated and inflammable air are inflamed, the product is mere water (A); for when theſe airs are employed in the proper proportion, only 0.02 of the mixture of both airs retains its aërial form. Now it is impoſſible to ſuppoſe that all the water obtained pre-exiſted in theſe airs; that is, that 49 parts in 50 were mere water.

83 Mr Kirwan's concluſions from them.

84 The foregoing theories not altogether ſatisfactory.

Notwithſtanding theſe poſitive concluſions, however, by ſome of the moſt reſpectable names in this country, the evidences adduced have been unſatisfactory to ſome French chemiſts; who maintain, that Meſſrs Cavendiſh, Prieſtley, and Kirwan, are totally miſtaken with regard to the production of water from dephlogiſticated and inflammable air; contending, that the water obtained had previouſly exiſted in the air, and was not originally produced in the operation. The fact, indeed, becomes ſomewhat dubious from ſome experiments related by Dr Prieſtley himſelf, and of which we ſhall now proceed to give an account.

 One

(A) The experiments of Mr Cavendiſh ſhow that nitrous acid is the product in this caſe. He takes notice of the difference between the reſult of the French experiments and his, but aſcribes it to their uſing inflammable air prepared from charcoal: His was from zinc.

One conſequence of the hypotheſis in queſtion is evident, that if water really be *produced* by the dephlagration of either dephlogiſticated or common air with in-
85 Difficulties ariſing in ſome of Dr Prieſtley's experiments.
flammable air, the quantity of liquid obtained ought to increaſe in proportion to the quantity of the two airs conſumed, and that without any limitation. This, however, is not the caſe, as Dr Prieſtley has obſerved. He had ſucceeded indeed with ſcales of iron and copper, as has already been related; and in the experiment with the latter, the production of water was ſo copious, that when only 3½ ounce-meaſures of air were abſorbed, the water ſtood in drops on the inſide of the veſſel, and ſome of theſe ran down it. Water was alſo procured by firing dephlogiſticated and inflammable air from iron by the electric ſpark in a cloſe veſſel, an experiment ſimilar to thoſe made by Mr Lavoiſier at Paris. In his firſt experiment he put 3.75 ounce meaſures of a mixture of air, of which one-third was dephlogiſticated and two-thirds inflammable air from iron, in a cloſe veſſel, and, after the exploſion, found in it one grain of moiſture; but on repeating the experiment with half as much dephlogiſticated as inflammable air, he could perceive no ſign of moiſture. The greateſt difficulty, however, which he ſays he ever met with reſpecting the preceding theory, aroſe from his never having been able to procure any water when he revived red precipitate in inflammable air, or at leaſt no more than might have been ſuppoſed to be contained in the inflammable air as an extraneous ſubſtance.

In order to make the experiments with the ſcales of iron and that with the red precipitate as much alike as poſſible, and compare them both to the greateſt advantage, he made them one immediately after the other, with every circumſtance as nearly the ſame as he could. The inflammable air was the ſame in both experiments, and both the ſcales of iron and red precipitate were made as dry as poſſible. They were heated in veſſels of the ſame ſize and form, and equally confined by dry mercury; and yet, with the former, water was produced as copiouſly as before, viz. running down the inſide of the veſſel in drops, when only four ounce-meaſures of inflammable air were abſorbed; but though he heated the red precipitate till eight ounce-meaſures of the inflammable air were abſorbed, and only 0.75 of an ounce-meaſure remained, there was hardly any ſenſible quantity of water produced, "certainly," ſays he, "not one-tenth of what appeared in the experiment with the ſcales of iron. In this experiment there can be no doubt but that the dephlogiſticated air produced from the red precipitate united with the inflammable air in the veſſel; and as no *water* equal to the weight of the two kinds of air was produced, they muſt have formed ſome more *ſolid ſubſtance*, which, in the ſmall quantities I was obliged to uſe, could not be found.

"The difficulty, with reſpect to what becomes of the two kinds of air, was not leſſened by the attempts which I made to collect all that I could from repeated decompoſitions of inflammable and dephlogiſticated air in a cloſe veſſel. As I had produced water in this proceſs when no more than a ſingle exploſion was made at a time, I thought that by continuing to make exploſions in the ſame veſſel, the water would not fail to accumulate till any quantity might be collected; and I intended to have collected a conſiderable part of an ounce. And as I ſhould know exactly what quantity of air I decompoſed, I had no doubt of being able to aſcertain the proportion that the water and air bore to each other. With this view a mixture was made of a large quantity of air, one-third dephlogiſticated and two-thirds inflammable, from iron and oil of vitriol.—But though I had a ſenſible quantity of water at the firſt exploſion (in each of which between four and five ounce-meaſures of the mixture of air were uſed), I was ſurpriſed to perceive no very ſenſible increaſe of the quantity of water on repeating the exploſions. Having therefore expended 48 ounce-meaſures of the mixture, the proceſs was diſcontinued; and, collecting the water with all the care that I could, I found no more than three grains, when there ought to have been eleven.

"In this proceſs the inſide of the veſſel was always very black after each exploſion; and when I poured in the mercury after the exploſion, though there was nothing viſible in the air within the veſſel, there iſſued 86
from the mouth of it a denſe vapour. This was the Inconden-
caſe, though I waited ſo long as two minutes after any ſible vapour
exploſion, before I proceeded to put in more mercury ariſing from
in order to make another; which, if the vapour had water.
been ſteam, would have been time more than ſufficient to permit it to condenſe into water. I even perceived this vapour when I had a quantity of water in the veſſel, and the exploſion was conſequently made over it, as well as in contact with the ſides of the veſſel which were wetted with it; ſo that, as this vapour had paſſed through the whole body of water when the veſſel was inverted, it is probable that it muſt have conſiſted of ſomething elſe than mere water. But I was never able to collect any quantity of it, though it muſt have been ſomething produced by the union of the two kinds of air."

In order to collect a quantity of this vapour, he contrived an apparatus, which, by diffuſing it through a thin glaſs veſſel, he ſuppoſed would condenſe all the contents whether fluid or ſolid; but after repeating the experiment as carefully as poſſible, by taking 20 exploſions, and repeating the whole ſeveral times over, he could find nothing in the veſſel beſides a ſmall quantity of water, which, added to that in the ſtrong veſſel, came far ſhort of the weight of the air that was decompoſed.

"All the conjecture," ſay he, "that I can advance, 87
in order to explain this phenomenon is, that ſince ſoot Prieſtley's
yields pure air, part of the ſoot is formed by the union conjecture
of the dephlogiſticated air in the atmoſphere, and the concerning
inflammable air of the fuel: but *ſmoke*, which contains this vapour.
much *ſoot*, is ſoon diſperſed, and becomes inviſible in the open air. Such, therefore, may be the caſe here. The ſoot formed by the union of the two kinds of air, may be diffuſed through the air, in the veſſel in which they are exploded, and be carried inviſibly into the common atmoſphere; which may account for my not being able to collect any quantity of it in this apparatus."

Not diſcouraged by this bad ſucceſs, the Doctor at- 88
tempted to collect this volatile matter by means of a Unſucceſs-
quantity of water incumbent upon the mercury in the ful attempts
ſtrong glaſs veſſel in which the exploſions were made, to collect it.
though he had found that part of it could eſcape through the water. He decompoſed a great quantity of the two kinds of air in theſe circumſtances; and preſently

Dephlogisticated Air.

fently found that the water became very cloudy, and was at length filled with a blackifh matter. This he collected, and found that it remained perfectly black upon the earthen veffel in which the water containing it was evaporated; which would not have been the cafe if the blackifh matter in the water had been that powder of mercury which is produced by agitating it in pure water: For that black mafs always became white running mercury the moment the water was evaporated from it. If a fufficient quantity of this matter could have been procured, he could have fatisfied himfelf whether it was foot or not.

89 Water in confiderable quantity obtained from dephlogifticated and inflammable air. — See Plate VIII. fig. 3.

"That water, in great quantities (fays he), is fometimes produced from burning inflammable and dephlogifticated air, is evident from the experiments of Meffrs Cavendifh and Lavoifier. I have alfo frequently collected confiderable quantities of water in this way, though never quite fo much as the weight of the two kinds of air decompofed. My apparatus for this purpofe was the following: Into the mouth of a large glafs balloon. I introduced a tube, from the orifice of which there continually iffued inflammable air from a veffel containing iron and oil of vitriol. This being lighted, continued to burn like a candle. Prefently after the lighting of it, the infide of the balloon always became cloudy, and the moifture foon gathered in drops, and fettled in the lower part of the balloon. To catch what might iffue in the form of vapour, in the current of air through the balloon, I placed the glafs tube *b*, in which I always found fome water condenfed. It is very poffible, however, that in both thefe modes of experimenting, the water may be converted into a kind of vapour, which is very different from fteam, and capable of being conveyed a great way through air, or even water, without condenfation along with the air with which it is mixed; and on this account it may not be poffible, in either of thefe modes of experimenting, to collect *all* the water into which the two kinds of air may be converted. The nature of this kind of vapour into which water may be changed, and which is not readily condenfed by cold, is very little underftood, but well deferves the attention of philofophers.

"That the water collected in the balloon comes from the decompofition of the air, and not from the frefh air circulating through it, was evident from placing balls of hot iron in the place of the flame, and finding that, though the balloon was as much heated by them as by the flame of the burning of the inflammable air, and confequently there muft have been the fame current of the external air through it, no moifture was found in the balloon."

Sect. IV. *Of Phlogifticated Air.*

The univerfal prejudice in favour of the exiftence of that principle named *Phlogifton*, firft fuggefted by Stahl, gave rife, on the firft appearance of Dr Prieftley's difcoveries, to a theory, concerning the action

89 Phlogiftication of air explained.

of this fubftance upon air and other bodies. As it had been obferved, that air was diminifhed, in fome cafes at leaft, by burning, univerfally by refpiration, and by fome other proceffes, it was imagined that phlogifton was a body of fuch a fingular nature, that when mixed with air, it always diminifhed its bulk, inftead of enlarging it, which might have been more naturally expected from the mixture of any vapour whatever. It was alfo fuppofed by fome, that the phlogifton was not only entirely devoid of gravity, but that it was a principle of *pofitive levity;* fo that the *abfolute* weight of bodies was diminifhed by an union with it, and augmented when it was expelled, though their *fpecific* gravity was diminifhed. Various other furprifing properties were attributed to phlogifton; fuch as that of giving elafticity to air, of conftituting flame by a *chemical combination* with air, &c. Its emiffion into the atmofphere was fuppofed to be always attended with a diminution of air; and therefore, all proceffes in which air was diminifhed and become noxious, fuch as that by liver of fulphur, a mixture of iron filings and brimftone, &c. were called *phlogiftic proceffes*. Refpiration of animals was taken into the fame account; but neither in this, nor in combuftion, was it allowed that any kind of vital fpirit was abforbed by the blood, or feparated from the air by the burning body. On the contrary, it was ftrenuoufly argued, that all this was performed by the *emiffion* of *phlogifton* from the lungs or the inflamed fubftance, which depraved the air, and diminifhed it in bulk; and as all air was fuppofed to contain phlogifton, it was likewife imagined, that in all cafes where air was mended, as by the growing of vegetables, or agitation in water, the emendation was accomplifhed, not by the emiffion of any thing into the atmofphere, but by the mere abforption of phlogifton. In other refpects this fubftance was thought to be an exceedingly powerful principle in nature; the light of the fun itfelf and the electric fluid being faid to be modifications of it, the different kinds of airs to be *phlogiftic vapours*, &c.; fo that the whole fyftem of nataure feemed ready to be abforbed by it at once.

Phlogifticated Air.

90 Too great powers attributed to phlogifton.

The formidable powers of this principle were firft checked by the difcoveries of Mr Lavoifier, though the latter erred equally on the contrary fide; and not content with keeping the phlogiftic principle within due bounds, would needs deny its exiftence altogether*. In a treatife publifhed in the year 1782, he firft impugns Dr Prieftley's theory of refpiration, and denies that "the refpiration of animals has the property of phlogifticating air in a manner fimilar to what is effected by the calcination of metals and many other chemical proceffes; and that it ceafes not to be refpirable till the inftant when it becomes furcharged, or at leaft faturated, with phlogifton."

91 Doctrine of phlogifton oppofed by the foreign chemifts.

* See *Phlogifton.*

92 M. Lavoifier's experiments on calcination of metals and refpiration.

In order to difprove this affertion, he introduced four ounces of mercury to 50 cubic inches of common air, propofing to calcine the metal by keeping it for 12 days in a heat almoft equal to that which is neceffary to make it boil. After the expiration of the appointed time, 45 grains of precipitate *per fe* were formed, and the air in the veffel was diminifhed by about $\frac{1}{6}$th of its volume. In this ftate it did not precipitate lime water; but inftantly extinguifhed candles, and killed animals immerfed in it; no longer affording any red vapours, or being diminifhed by mixture with nitrous air: On diftilling the precipitate produced, about as much dephlogifticated air was obtained as had been left by the common air in the calcination; and by recombining this with the noxious air left in the veffel, he recompofed a fluid nearly of the fame goodnefs with common air. Hence he draws the following conclu-

fions:

Phlogisticated Air.

fions: 1. That $\frac{4}{5}$ths of the air we breathe are mephitic, or incapable of fupporting the refpiration of animals, or the inflammation and combuftion of bodies. 2. That the furplus, or only $\frac{1}{5}$th of the volume of atmofperical air, is refpirable. 3. That in the calcination of mercury, this metallic fubftance abforbs the falubrious part, leaving only the mephitic portion of the air. 4. That by reuniting thefe two portions which had been feparated, we can recompound air fimilar to that of the atmofphere.

93 Compofition of atmofpherical air.

94 Effects of refpiration on air.

To determine the effects of refpiration upon air, a live fparrow was placed under a glafs receiver, filled with common air and inverted in mercury, containing 31 cubic inches. In a quarter of an hour it became agitated, and in 55 minutes died convulfed. Notwithftanding the heat of the animal, which neceffarily, at firft, rarified the air in the receiver, there was a fenfible diminution of its bulk; which, at the end of 15 minutes, amounted to one-fortieth: but, inftead of increafing afterwards, the diminution became fomething lefs in about half an hour; and when the animal was dead, and the air in the receiver had recovered the temperature of the room where the experiment was made, the diminution did not appear to exceed one-fixtieth part.—This air which had been refpired by the fparrow, though in many refpects fimilar to that in which the mercury had been calcined, differed from it in this refpect, that it precipitated lime-water, and, by introducing cauftic fixed alkali to it, was reduced one-fixth in bulk by the abforption of fixed air; after which it appeared exactly the fame with that produced by the calcination of mercury or other metals; and atmofpherical air was recompofed by mixing this with pure dephlogifticated air in the proportions already mentioned.

95 Scheele's experiments.

That common air is compounded of two kinds of elaftic fluids, Mr Scheele has proved by the following experiment: "I diffolved (fays he) one ounce of alkaline liver of fulphur in eight ounces of water; of this folution I poured four ounces into an empty bottle, whofe capacity was 24 ounces, and worked it well; then I turned the bottle, immerfed its neck into a fmall veffel with water, and kept it in this pofition a fortnight. The folution had partly loft its red colour, and fome fulphur had been precipitated from it during this time. After this I put the bottle in the fame pofition in a larger veffel with water, keeping the mouth and neck under water, and the bottom of the bottle above water, and thus I drew the cork under water, which immediately rufhed with violence into the bottle. On examining the quantity of water in the bottle, it was found, that during this fortnight, fix parts out of 20 of air were loft." On repeating the experiment with the fame materials, and in the fame bottle, only four parts out of 20 were loft by ftanding a week, and no more than fix after four months.

96 Compofition of atmofpherical air demonftrated.

From thefe experiments, and many others fimilar, it appears that the doctrine of phlogifton had been carried too far by Dr Prieftley and other Britifh philofophers, and that the air confifts of two kinds of fluids; one perfectly falutary, and friendly in the higheft degree to animal life; the other altogether unfit for it. Thefe two appear incapable of being converted directly into one another by any procefs, natural or artificial: for though both are deftructible, yet they are always converted into other fubftances; from which, indeed, either the one or the other may be extracted at pleafure by employing the proper methods. The ftrongeft arguments in favour of the transfmutation of phlogifticated air into that of a purer kind, were drawn from the purification of noxious air by vegetation, and by agitation in water. In the former cafe, however, it has been obferved in the laft fection, that this feeming purification is no other than an exchange of the one air for the other; the vegetables abforbing the phlogifticated, and emitting the dephlogifticated air in its ftead. With refpect to the agitation in water, the matter remained more dubious; and it is only in the laft volume of Dr Prieftley's treatife that we have any account of this being accomplifhed by an emiffion of purer air from the water.—"In the infancy of my experiments," fays he, "I concluded, that all kinds of air were brought by agitation to the fame ftate; the pureft air being partially phlogifticated, and air completely phlogifticated being thereby made purer; inflammable air alfo lofing its inflammability, and all of them brought into fuch a ftate as that a candle would juft go out in them. This inference I made from all the kinds of air with which I was then acquainted, and which did not require to be confined by mercury, being brought to that ftate by agitation in a trough of water, the furface of which was expofed to the open air; never imagining that when the air in my jar was feparated from the common air by a body of water, generally about twelve inches in depth (adding that within to that without the jar), they could have any influence on each other. I have, however, been long convinced, that, improbable as it then appeared to me, this is actually the cafe."

Phlogifticated Air.

97 How air is purified by agitation in water Exper. and Obferv. vi. 385

98 Water pervious to air, and purifies it in paffing through.

This remarkable fact is illuftrated by the following experiments: 1. About three ounce-meafures of air, phlogifticated by nitrous air, was agitated for a quarter of an hour in a veffel containing 20 ounces of water, which had been boiled for feveral hours, and which was ftill very warm. By this procefs it became diminifhed one-fixth, and confiderably improved in quality. The next day the remainder was agitated for another quarter of an hour, and the water which had been boiled at the fame time, when it was alfo diminifhed in quantity and improved in quality. 2. An equal quantity of air, phlogifticated by means of iron-filings and brimftone, being agitated for 20 minutes, was diminifhed by one-feventh, and improved fo far that a candle would burn in it. 3. After expelling all the air he could from a quantity of water by boiling, he put to it, in feparate phials, air that had been phlogifticated with iron-filings and brimftone, as well as that which the heat had expelled, leaving them with their mouths in water, and agitating them occafionally. On examining the phials in about two months, he found both the air that was confined by water and that which had been expelled by heat completely phlogifticated. 4. That water does imbibe the purer part of the atmofphere, in preference to that which is impure, is evident, he fays, from any examination of it: For if the water be clear, and free from any thing that is putrefcent, the air expelled from it by heat is generally of the ftandard of 1; whereas that of the atmofphere, when the nitrous air is the pureft, is about 1.2.

99 Properties of phlogifticated air.

Phlogifticated air is equally invifible with common air, and fomething more elaftic. Mr Kirwan pro-

cured

Phlogisticated Air.

cured some perfectly phlogisticated, so that it was not in the least diminished by nitrous air, from a mixture of iron-filings and brimstone. Having dried it by frequently introducing dry filtering paper under the jar that contained it, he found its weight to be to that of the common air as 985 to 1000, the barometer standing at 30.46 and the thermometer at 60°. The other properties of it are, that it is extremely fatal to animal life, and friendly to that of vegetables, insomuch that it is now generally believed to be the true and proper nourishment of the latter. It seems to exist originally, in very large quantity, in our atmosphere. It may be separated from the common mass of air by combustion, by respiration, by putrefaction, and in short by every species of phlogistic process; neither is there any other species of air but what may be converted into this by means of fire, dephlogisticated air alone excepted.

100 Nitrous acid procured from phlogisticated air.

Phlogisticated air is now generally believed to be a combination of the nitrous acid with phlogiston; and that, in its gradual progress towards this, which is its ultimate stage, it first assumes the character of phlogisticated nitrous acid; then of nitrous air, in which it readily parts with its phlogiston to the atmosphere, or rather to the dephlogisticated part of it; and lastly, it becomes phlogisticated air, in which the union betwixt the principles is so strong, that it cannot be broken by simple exposure to dephlogisticated air without heat; though the experiments of Mr Cavendish show, that this may be done by means of the electric spark, which produces the most violent heat we can imagine.

It had been frequently observed, that common atmospherical air was always diminished by taking the electric spark in it; and this dminution was supposed to be occasioned by the *phlogistication* of the air, and separation of its fixed part; in consequence of which it was urged, that lime-water is precipitated by taking the electric spark over it in a small quantity of air.

101 Mr Cavendish's experiments on the production of nitrous acid.

Mr Cavendish, however, who has carefully examined this subject, denies that any fixed air is produced in this manner; and by a set of very curious experiments, published in the 75th volume of the Philosophical Transactions, has clearly shown that nitrous acid, and not fixed air, is the product of this operation.

The apparatus used in these experiments, was that represented Plate VIII. fig. 4. and consists only of a crooked glass tube, whose ends are plunged into quicksilver contained in two glasses, in the middle part of which the air is confined betwixt the two portions of quicksilver. The air was introduced by means of a smaller tube, fig. 5. the tube M of the former figure being filled with quicksilver, the bent end of which was introduced into a jar DEF, filled with the proper kind of air, and inverted in water. The end C being stopped by the finger, the quicksilver was thus prevented from falling out, let the tube be placed in what position it would, until this pressure was removed. Upon introducing the crooked tube into the jar in the position represented in the figure, and removing the finger from the orifice at C, the quicksilver would descend; and by stopping this orifice again, any quantity of the fluid may be allowed to run out, and the empty space of the tube will be filled with the air desired. Having thus got the proper quantity of air into the tube ABC, it was held with the end C uppermost, and stopped with the finger; and the end A, made smaller for that purpose, being introduced into the end of the bent tube M, the air, on removing the finger from C, was forced into that tube by the pressure of the quicksilver in the leg BC. Thus he was enabled to introduce any quantity he pleased of any kind of air into the tube M; and by the same means it was in his power to let up any quantity of soap-ley, or other liquor which he wanted to be in contact with it. In one case, however, in which he wished to introduce air into the tube many times in the same experiment, he made use of the apparatus represented fig. 6. consisting of a tube AB, of a smaller bore, a ball C and a tube DE of a larger bore. This apparatus was first filled with quicksilver; and then the ball C and the tube AB were filled with air, by introducing the end A under a glass inverted into water, which contained the proper kind of air, and drawing out the quicksilver from the leg ED by a syphon. After being thus furnished with air, the apparatus was weighed, and the end A introduced into one end of the tube M, and kept there during the experiment; the way of forcing air out of this apparatus into the tube being by thrusting down the tube ED, a wooden cylinder of such a size as almost to fill up the whole bore, and by occasionally pouring quicksilver into the same tube, to supply the place of that pushed into the ball C. After the experiment was finished, the apparatus was weighed again, which showed exactly how much air had been forced into the tube M during the whole experiment; it being equal in bulk to a quantity of quicksilver, whose weight was equal to the increase of weight of the apparatus. The bore of the tube M, used in these experiments, was about the tenth of an inch in diameter; and the length of the column of air occupying the upper part of the tube was in general from $\frac{1}{4}$ths to $1\frac{1}{2}$ inches.—In order to force an electrical spark through the tube M, it was necessary to place an insulated ball at such a distance from the conductor as to receive a spark from it, and to make a communication between that ball and the quicksilver in one of the glasses, while the quicksilver in the other glass communicated with the ground.

When the electric spark was made to pass through common air included between short columns of a solution of litmus, the solution acquired a red colour, and the air was diminished, as had been observed by Dr Priestley. When lime-water was used instead of the solution of litmus, and the spark was continued till the air could be no farther diminished; but not the smallest cloud be perceived in the water, though the air was reduced to two thirds of its original bulk; which is a greater diminution than it could have suffered by any phlogistic process, that being little more than one-fifth of the whole. The experiment being repeated with impure dephlogisticated air, a great diminution took place, but without any cloud in the lime-water. Neither was any cloud produced when fixed air was let up into it; but, on the addition of a little caustic volatile alkali, a brown sediment immediately appeared.

It being thus evident that the lime was saturated by some acid produced in the operation, the experiment was repeated with soap-leys, to discover the nature of it. A previous experiment had been made in order to know what degree of purity the air ought to be of to produce the greatest diminution; and thus it was found,

found, that when good dephlogiſticated air was uſed, the diminution was but ſmall; where perfectly phlogiſticated air was made uſe of, no ſenſible diminution took place; but when five parts of pure dephlogiſticated air were mixed with three of common air, almoſt the whole was made to diſappear.—It muſt be remembered, that common air conſiſts of one part of dephlogiſticated and four of phlogiſticated air; ſo that a mixture of five parts of pure dephlogiſticated air and three of common air, is the ſame thing as a mixture of ſeven parts of dephlogiſticated air with three of phlogiſticated. Having made theſe previous trials, he introduced into the tube a little ſoap-leys, and then let up ſome dephlogiſticated and common air mixed in the above mentioned proportions, which, riſing into the tube M, divided the ſoap-leys into its two legs. As faſt as the air was diminiſhed by the electric ſpark, he continued to add more of the ſame kind till no further diminution took place. The ſoap-leys being then poured out of the tube, and ſeparated from the quickſilver, ſeemed to be perfectly neutralized, as they did not at all diſcolour paper tinged with blue flowers. On evaporating the liquid to dryneſs, a ſmall quantity of ſalt was left, which was evidently nitre, from the manner in which a paper impregnated with the ſolution of it burned. On repeating the experiment on a larger ſcale, with five times the quantity of materials, pure nitre was obtained in proportion, and was found, by the teſt of *terra ponderoſa ſalita*, to contain no more vitriolic acid than what might have been expected in the ſoap-ley itſelf, and which is exceedingly ſmall.

102 Proportions of the different airs neceſſary for the production of nitrous acid.

103 Mr Cavendiſh's opinions on the nature of phlogiſticated air.

As, in ſome former experiments of Mr Cavendiſh, it had been found, that by deflagrating nitre with charcoal, the whole of the acid was converted into phlogiſticated air, he concluded that this kind of air is nothing elſe than nitrous acid united to phlogiſton; according to which, it ought to be converted into nitrous acid by being deprived of its phlogiſton. "But (ſays he) as dephlogiſticated air is only water deprived of phlogiſton, it is plain, that adding dephlogiſticated air to a body, is equivalent to depriving it of phlogiſton, and adding water to it; and therefore phlogiſticated air ought alſo to be reduced to nitrous acid, by being made to unite or form a chemical combination with dephlogiſticated air; only the acid thus formed will be more dilute than if the phlogiſticated air was ſimply deprived of phlogiſton.

"This being premiſed, we may ſafely conclude, that in the preſent experiments, the phlogiſticated air was enabled, by means of the electrical ſpark, to unite to, or form a chemical combination with, the dephlogiſticated air, and was thereby reduced to nitrous acid, which united to the ſoap-leys, and formed a ſolution of nitre; for in theſe experiments the two airs actually diſappeared, and nitrous acid was formed in their room: and as it has been ſhown, from other circumſtances, that phlogiſticated air muſt form nitrous acid when combined with dephlogiſticated air, the abovementioned opinion ſeems to be ſufficiently eſtabliſhed. And a further confirmation is, that no diminution of air is perceived when the electric ſpark is paſſed either through pure dephlogiſticated or through perfectly phlogiſticated air; which indicates a neceſſity for the combination of the two in order to produce nitrous acid. It was alſo found by the laſt experiment, that the quantity of nitre produced was the ſame that would have been obtained from the ſoap-leys, had they been ſaturated with nitrous acid; which ſhows, that the production of the nitre was not owing to any decompoſition of the ſoap-leys.

"The ſoap-leys uſed in the foregoing experiments were made from ſalt of tartar prepared without nitre, and were of ſuch a ſtrength as to yield one-tenth of their weight of nitre when ſaturated with nitrous acid. The dephlogiſticated air was alſo produced without nitre; that uſed in the firſt experiment with the ſoap-leys being procured from the black powder formed by the agitation of quickſilver mixed with lead, and that uſed in the latter from turbith mineral. In the firſt experiment, the quantity of ſoap-leys uſed was 35 meaſures, each of which was equal in bulk to one grain of quickſilver; and that of the air abſorbed was 416 ſuch meaſures of phlogiſticated air and 914 of dephlogiſticated. In the ſecond experiment, 178 meaſures of ſoap-leys were uſed; which abſorbed 1920 of phlogiſticated air and 4860 of dephlogiſticated. It muſt be be obſerved, however, that in both experiments ſome air remained in the tube undecompoſed, whoſe degree of purity I had no means of trying; ſo that the proportion of each ſpecies of air abſorbed cannot be known with much exactneſs.

"As far as the experiments hitherto publiſhed extend, we ſcarcely know more of the nature of the phlogiſticated part of the atmoſphere, than that it is not diminiſhed by lime-water, cauſtic alkalis, or nitrous air; that it is unfit to ſupport fire or maintain life in animals; and that its ſpecific gravity is not much leſs than that of common air: ſo that though the nitrous acid, by being united to phlogiſton, is converted into air poſſeſſed of theſe properties; and, conſequently, though it was reaſonable to ſuppoſe, that part at leaſt of the phlogiſticated air of the atmoſphere conſiſts of this acid united to phlogiſton; yet it might be fairly doubted whether the whole is of this kind, or whether there are not, in reality, many different ſubſtances confounded by us under the name of phlogiſticated air. I therefore made an experiment to determine whether the whole of a given portion of the atmoſphere could be reduced to nitrous acid, or whether there was not a part of a different nature from the reſt, which would refuſe to undergo that change. For this purpoſe, I diminiſhed a ſimilar mixture of dephlogiſticated and common air in the ſame manner as before, until it was reduced to a ſmall part of its original bulk; after which ſome dephlogiſticated air was added, and the ſpark continued until no further diminution took place. Having by theſe means condenſed as much as I could of the phlogiſticated air, I let up ſome ſolution of liver of ſulphur to abſorb the dephlogiſticated air; after which only a ſmall bubble of air remained unabſorbed, which certainly was not more than $\frac{1}{120}$th of the bulk of the phlogiſticated air let up into the tube; ſo that if there is any part of the phlogiſticated air of our atmoſphere which differs from the reſt, and cannot be reduced to nitrous acid, we may ſafely conclude, that it is not more than $\frac{1}{120}$th part of the whole."

104 Experiment to determine the nature of phlogiſticated air.

Though theſe experiments had ſhown, that the chief cauſe of this diminution of airs is the converſion of the phlogiſticated kind into nitrous acid, it ſeemed not

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not unlikely, that when any liquor containing inflammable matter was in contact with the air in the tube, some of this matter might be burnt by the spark, and thereby diminish the air. In order to determine this, the electric spark was passed through dephlogisticated air included between different liquors; and the result of the experiments was, that when dephlogisticated air, containing only $\frac{1}{20}$th part of its bulk of phlogisticated air, was confined between short columns of soap-leys, and the spark passed through it till no farther diminution could be perceived, the air lost $\frac{43}{100}$ds of its bulk; which is not a greater diminution than might very likely proceed from the decomposition of the small quantity of phlogisticated air contained in it, as the dephlogisticated air might easily be mixed with a small quantity of common air while putting into the tube. When the same dephlogisticated air was confined between columns of distilled water, the diminution was rather greater than before, and a white powder was formed on the surface of the quicksilver beneath: the reason of which, in all probability, was, that the acid produced in the operation corroded the quicksilver, and formed the powder; and that the nitrous air produced by that corrosion united to the dephlogisticated air, and caused a greater diminution than would otherwise have taken place. When a solution of litmus was used instead of distilled water, the solution soon acquired a red colour; which grew paler and paler as the spark was continued, till it became quite colourless and transparent. The air was diminished by almost one-half, and might perhaps have been further diminished had the spark been continued. When lime-water was let up into the tube, a cloud was formed, and the air was further diminished by about one-fifth; the remainder was good dephlogisticated air. In this experiment, therefore, the litmus was, if not burnt, at least decompounded, so as to lose entirely its purple colour, and to yield fixed air; so that, though soap-leys cannot be decompounded by this process, yet the solution of litmus can, and so very likely might the solutions of many other substances be. But there is nothing in any of these experiments which favours the opinion of the air being at all diminished by means of phlogiston communicated to it by the electric spark.

105 Effects of the electric spark on dephlogisticated air inclosed between different liquors.

Sect. V. *Of Fixed Air.*

The discovery of this kind of air is as old as Van Helmont; who gave it the name of *gas silvestre*, from its being emitted in great quantity by burning charcoal. Subsequent discoveries showed, that a fluid of the same kind was plentifully produced by fermenting liquor, in almost every kind of combustion, and naturally generated in vast quantity in mines and coal-pits, where it is known by the name of the *choak-damp*; that it exists in a concrete state in alkaline salts, chalk, limestone, the shells of marine animals, magnesia alba, &c. in a very large proportion, constituting one-half, and sometimes more of their weight; and that it might always be extracted from the atmosphere, in unlimited quantity, by exposing certain substances to it.—On examining the nature of this fluid, it was found so manifestly acid, that it has now obtained a place among these substances under the name of *aërial acid*; or, more improperly, *cretaceous acid*, from its being contained in great quantities in chalk, as has been already mentioned.

106 Fixed air found in a great variety of substances.

Fixed Air.

Fixed air is the heaviest of all permanently elastic fluids, excepting those derived from the mineral acids. Mr Kirwan determines it to be to common air as 1500 to 1000, the barometer being at 29.85, the thermometer at 64, and the fixed air being extracted from calcareous spar by marine acid, whose specific gravity was 1.0145. He observes, however, that though this air was obtained in the driest manner possible, and that the globe which contained it appeared perfectly free from moisture; yet, when carried into a room 27 degrees colder, the inside of the globe was covered with dew, which soon formed visible drops.—In its concrete state, fixed air is one of the heaviest bodies in nature. Mr Kirwan, in the 71st volume of the Philosophical Transactions, gives an account of his ingenious method of finding the specific gravity of fixed air in its fixed state, when combined with calcareous earth; from which it appears, that fixed air, in that state, is prodigiously concentrated, and, were it possible to exist by itself in that concentrated state, it would be the heaviest body known, gold and platina excepted.

107 Specific gravity, &c. of fixed air.

Mr Kirwan first ascertained the specific gravity of a piece of white marble; then expelled the fixed air from a known weight of it finely powdered, by means of diluted vitriolic acid; the bulk and weight of the obtained fixed air being ascertained. Next, he calcined a known quantity of the same sort of marble, by keeping it in a white heat for the space of 14 hours; after which, being weighed again, and from the weight lost by this calcination, the weight of the fixed air, which must have escaped from it according to the above mentioned experiment, being subtracted, the remainder is the weight of water contained in the marble; from which experiments it appears, that 100 grains of the marble contained 32.42 grains of fixed air, 11.66 grains of water, and 55.92 grains of pure calcareous earth.

"I next (says he) proceeded to discover the specific gravity of the lime. Into a brass box, which weighed 607.65 grains, and in the bottom of which a small hole was drilled, I stuffed as much as possible of the finely-powdered lime, and then screwed the cover on, and weighed it both in air and in water. When immersed in this latter, a considerable quantity of common air was expelled; when this ceased, I weighed it. The result of this experiment is as follows:

	Grains.
Weight of the box in air - -	607.65
Its loss of weight in water - -	73.75
Weight of the box and lime in air - -	1043.5
Weight of the lime singly in air - -	435.85
Loss of weight of the box and lime in water -	256.5
Loss of weight of the lime singly - -	182.3

"Hence, dividing the absolute weight of the lime by its loss in water, its specific gravity was found to be 2.3908.

"From these data I deduced the specific gravity of fixed air in its fixed state; for 100 grains of marble consist of 55.92 of earth, 32.42 of fixed air, and 11.66 of water; and the specific gravity of the marble is 2.717. Now the specific gravity of the fixed air, in its fixed state, is as its absolute weight, divided by its loss of weight in water; and its loss of weight in water is as the

Fixed Air.

the loss of 100 grains of marble, *minus* the losses of the pure calcareous earth and the water.

Loss of 100 grs. of marble $=\frac{100}{2.717}=36.8$ grs.

Loss of 55.92 grs. of calcareous earth - - $=\frac{55.92}{2.39}=23.39$ grs.

Loss of 11.66 grs. of water = - 11.66

35.05

"Then the loss of the fixed air $36.8-35.05=1.75$; consequently its specific gravity is $\frac{32.42}{1.75}=18.52$."

108 Its other properties.

Fixed air differs considerably in its properties from the airs already mentioned. Its acidity is manifest to the taste, and still more from its neutralising both fixed and volatile alkalis; which it will do in such a manner as not only to destroy their causticity, but to give them a manifestly acid taste, and will moreover enable them to form crystals of a neutral or acidulous salt. It has a considerable antiseptic power, and will even check the putrefaction of animal substances; though it has been observed, that in this case it acts only by absorbing the putrid effluvia already emitted from the body, and becomes itself very offensive, while it sweetens the other. When taken into the lungs, it is equally poisonous with phlogisticated or any other noxious air, and extinguishes flame as effectually; but, when mixed with dephlogisticated air, may be inspired without any danger, and even in its pure state may be swallowed in large quantities, not only without danger, but with the most salutary effects in some diseases, whence it has now become an article of the Materia Medica. As an acid it stands in the lowest rank, being expelled from alkalis by every other; though it is capable of separating oils, sulphur, and the colouring matter of Prussian blue, from the substances with which they are combined.

109 Constituent principles of fixed air.

The origin of this acid was for a long time as much unknown as that of the others; and while the general prejudice remained that acids were a kind of primary elements unchangeable in their nature, it was supposed that fixed air was some modification of the others, probably the nitrous. But the discoveries made of late years, have abundantly shown, that the chemical principles are by no means so indestructible as they were imagined; and that the vegetable acids particularly, may be almost totally resolved into fixed air. Hence it was naturally suggested, that fixed air itself might be a compound of some other principles; and it was suggested by Dr Black, that it was a combination of atmospherical air with phlogiston. As the air of our atmosphere, however, is compounded of two substances, one of which naturally contains no phlogiston, and the other as much as it can hold; it seemed unlikely that there should be any possibility of adding to the quantity of phlogiston contained in a portion of the atmosphere, without decomposing it in some manner or other. Succeeding experiments evinced, that it was by a decomposition of the pure part of atmospherical air, and a combination of the phlogiston of the fuel with its basis, that fixed air was produced; and this fact was evinced by numerous experiments made by Mr Kirwan, Mr Lavoisier, and Dr Priestley, so that it is now looked upon to be generally established: and as the experiments made by Dr Priestley appear fully as convincing as any, we shall here content ourselves with giving an account of them.

110 Dr Priestley's experiments on the composition of fixed air.

The compound nature of fixed air, and the principles from which it is formed, were first discovered by Mr Kirwan; but Dr Priestley was not convinced by the proofs he adduced, till after making some experiments of his own. The first was, by firing shavings of iron in dephlogisticated air; when he observed a considerable residuum of fixed air, though that in the receiver had been of the purest dephlogisticated kind, and iron could only have yielded inflammable air. The hypothesis of Mr Kirwan was still further confirmed by an experiment in which iron-filings, which could only have yielded inflammable air, were mixed with red precipitate, which is known to yield only pure dephlogisticated air. On heating these in a glass retort, they gave a great quantity of fixed air, in some portions of which nineteen-twentieths were absorbed by lime-water, and the residuum was inflammable; but when the red precipitate was mixed with powdered charcoal, which had been found to yield only inflammable air, the fixed air produced from it was so pure that only one-fortieth part remained unabsorbed by water, which is as pure as that generally prepared from chalk and oil of vitriol. In some of these experiments it appeared, that three ounce-measures of dephlogisticated air went to the composition of two of fixed air: for one ounce of red precipitate gave 60 ounce-measures of dephlogisticated air; and, when mixed with two ounces of iron-filings, it gave about 40 ounce-measures of fixed air that were actually absorbed by water, besides a residuum that was inflammable. The same proportion was obtained when half the quantity of materials were made use of; but on using an onnce of each, only 20 ounce-measures of fixed air, including the residuum, could be got.

In considering this subject farther, it occurred to Dr Priestley, that his experiments, in which charcoal was used, lay open to an objection, that since dry wood, and imperfectly made charcoal, yield fixed air, it might be said, that all the elements of fixed air are contained in charcoal; and though this substance alone, even with the assistance of water, will not yield fixed air, this might be effected by treating it with other substances without their importing any thing to it; especially as the inflammable air procured from charcoal by means of water, appears to contain fixed air when decomposed with the dephlogisticated kind. In order to expel all the fixed air from charcoal, he made a quantity of it from dry oak, and pounding it while hot, instantly mixed four measures of it with one of red precipitate, and, putting them into an earthen retort, got, with a heat no greater than what was sufficient to revive the mercury, a large quantity of air, half of which was fixed. Afterwards the proportion of fixed air was less, and at last no fixed air at all was obtained; but as the residuum was worse than the common atmosphere, he is thence inclined to believe, notwithstanding Mr Cavendish's experiments, that phlogisticated air may be composed of phlogiston and dephlogisticated air. In another experiment he found a better proportion of charcoal and red precipitate. This was by mixing one ounce of precipitate with the same quantity of perfect char-

111 Priestley's opinion concerning the composition of phlogisticated air.

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charcoal hot from the retort in which it was made. Putting these into a coated retort, he expelled from them, by a strong heat, about 30 ounce-measures of air, the whole of which was the purest fixed air, leaving only about one-fortieth part unabsorbed by water, and this almost perfectly phlogisticated.

Having recollected, that in some former experiments he had obtained fixed air from nitrous acid and charcoal, he therefore repeated the experiment with some of the same charcoal which had then been made use of; when fixed air was obtained, in the quantity sometimes only of one-fifth, and sometimes of one-half; to the formation of which he supposed the dephlogisticated air produced by heating the nitrous acid must have contributed. On account of the objections, however, which might be made to the use of charcoal, he next employed *iron*, which was liable to nothing of this kind; and on mixing an ounce of iron-filings with as much charcoal, and then heating them in a glass retort, he obtained 20 ounce-measures of air, of which one-seventh remained unabsorbed by water. The residuum was of the standard of 1.52, but slightly inflammable. Repeating the experiment with half an ounce of iron filings, he got 26 ounce-measures of air, of which the first part was pretty pure, but afterwards one-tenth remained unabsorbed by water; but on mixing one ounce of precipitate with two ounces of filings, he got about 40 ounce-measures of air, of the first portions of which only one-twentieth was unabsorbed by water, though towards the conclusion the residuum was greater. In this process he got in all 36 ounce-measures of pure fixed air, completely absorbed by water, besides about other four ounce-measures, which, he supposes, might have been absorbed in receiving the air and transferring it into other vessels.

Fixed air was also produced from red precipitate mixed with brass filings, with zinc, from turbith mineral with iron filings, and from the black powder into which mercury mixed with lead is easily converted. In this last case the Doctor supposes that the fixed air was produced from the dephlogisticated kind absorbed by the metals and the phlogiston of the lead; and this is confirmed by an observation that the fixed air always comes first in the process, when the phlogiston is most readily separated, but afterwards the produce becomes quite pure and dephlogisticated. In attempting, however, to increase the quantity of fixed air by heating this black powder in dephlogisticated air, he found only an augmentation of the quantity of dephlogisticated air, and that of the purest kind.

"Perhaps," says he, "as decisive a proof as any of the real production of fixed air from phlogiston and dephlogisticated air, may be drawn from the experiments in which I always found a quantity of it when I burned sulphur in dephlogisticated air. In one of these experiments, to which I gave particular attention, six ounce-measures and an half of the dephlogisticated air were reduced to about two ounce-measures, and one-fifth of this was fixed air. When both the vitriolic acid and fixed air produced by this operation were absorbed by water, the remainder was very pure dephlogisticated air.

"I had always concluded, that no fixed air could be procured by the decomposition of inflammable air which had been produced by mineral acids, because I had not been able to do it with that which I had got by means of vitriolic acid; but I learned from Mr Metherie, that this is peculiar to the vitriolic acid, the remains of which, diffused through the inflammable air, procured by it, he conjectures, may actually decompose the fixed air produced in the process. For, as I have hinted before, when the inflammable air is produced from iron by means of spirit of salt, there is a very perceivable quantity of fixed air when it is united with dephlogisticated air. When I decomposed these two kinds of air in equal quantities, they were reduced to about 0.5 of a measure, and of this not more than about one fortieth part was fixed air. This experiment ought, however, to be added to the other proofs of fixed air being produced by the union of dephlogisticated air and phlogiston.

112 Proportion of fixed air produced from dephlogisticated air.

"The last instance, which I shall mention, of the generation of fixed air from phlogiston and dephlogisticated air, is of a much more striking nature than any that I have yet recited. Having made what I call *charcoal of copper*, by passing the vapour of spirit of wine over copper when it was red-hot, I heated a piece of it in different kinds of air. In common air, observing neither increase nor decrease in the quantity, I concluded, perhaps too hastily, that no change was made in it: for when I repeated the experiment in dephlogisticated air, the charcoal burned very intensely; and when a part of it was consumed, which (like common charcoal in the same process, was done without leaving any sensible residuum) I found that no heat which I could apply afterwards, had any farther effect on what was left of the charcoal. Concluding, therefore, that some change must be made in the quality of the air, I examined it, and found about nine-tenths to be the purest fixed air; and the residuum was such as would have been made by separating the absolutely pure part of the dephlogisticated air, leaving all the impurities behind.—Having ascertained this fact, I repeated the experiment, weighing the piece of charcoal very carefully before and after the process; and then found, that by the loss of one grain of charcoal, I reduced four ounce-measures of dephlogisticated air till one-ninth only remained unabsorbed by water; and again, with the loss of one grain and an half of the charcoal, I reduced six and an half-measures of dephlogisticated air till five and an half-measures were pure fixed air. In this process there was a diminution of bulk after the experiment, as might have been expected from the change of the air into one of a heavier kind by means of a substance or principle that could not add much to the weight of it. In one of the experiments, 4.3 ounce-measures of dephlogisticated air were reduced about one-thirtieth part of the whole; and in this case, when the fixed air was separated by water, there was a residuum of 0.75 of a measure of the standard of 1.0, whereas the dephlogisticated air, before the experiment, had been of the standard of 0.2.

"That dephlogisticated air actually enters into the composition of the fixed air, in this experiment, is evident from the weight of the latter, which far exceeds that of the charcoal dispersed in the process. For, in this last experiment, the weight of the fixed air produced was 4.95 grains. Consequently, supposing the charcoal to be wholly phlogiston, as it is very nearly so, fixed air may be said to consist of 3.45 parts of dephlogisticated

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giſticated air, and 1.5 of phlogiſton; ſo that the dephlogiſticated air is more than three times the proportion of phlogiſton in it.—I muſt not conclude, however, without obſerving, that, in one experiment, I never failed to produce fixed air; though it is not eaſy to ſee how *one* of its ſuppoſed elements, viz. dephlogiſticated air, could enter into it. This is by heating iron in vitriolic acid air. In one of theſe experiments, four ounce-meaſures of the vitriolic acid air were reduced to 0.65 of an ounce-meaſure; and of the quantity loſt three and an half meaſures were fixed air abſorbed by lime-water, and the remainder weakly inflammable."

113 Effects of the electric ſpark on fixed air.

Fixed air, even when pure and unmixed, is remarkably altered by the electric ſpark, part of it being thus rendered immiſcible in water. Dr Prieſtley, having taken the electric ſpark for about two hours in a ſmall quantity of fixed air confined by mercury, found, that after the operation one-fourth of it remained immiſcible with water; though, before it, only one-thirtieth part had remained unabſorbed. The inſide of the tube had become very black; which, in other experiments of a ſimilar kind with vitriolic acid air, he had obſerved to ariſe from the adheſion of a ſmall quantity of mercury ſuperſaturated with phlogiſton. In another experiment, in which the ſpark was taken an hour and ten minutes in about half an ounce-meaſure of fixed air, one-fifth remained unabſorbed, and the ſtandard of the reſiduum was 0.9; though, before the operation, only one-thirtieth part had been abſorbed, and the ſtandard of the reſiduum was 1.0. In this experiment, alſo, he obſerved, that the air was increaſed about a twentieth part. On taking the electric ſpark an hour in half an ounce of fixed air, as much reſiduum was left as had remained in five times the quantity of the ſame fixed air in which no ſpark had been taken. This reſiduum was alſo much purer than that of the original fixed air, the ſtandard being 0.8; whereas that of the original fixed air had been, as before, 1.0. On repeating the experiment, he found the reſiduum ſtill greater, but equally pure; and, in this caſe, a good quantity of black matter was obſerved adhering to the tube. Having taken the ſpark in a ſmall tube containing $\frac{1}{15}$th of an ounce-meaſure of fixed air, the inſide of the tube was clouded with black matter, and in the bottom was

114 Experiment in favour of Prieſtley's hypotheſis concerning the compoſition of phlogiſticated air.

a ſmall quantity of yellowiſh matter reſembling ſulphur; the reſiduum was between one-fourth and one-fifth of the whole, and leſs pure than formerly. This circumſtance he alſo ſuppoſes to be a proof that fixed air may be compoſed of phlogiſton and dephlogiſticated air. Purſuing this experiment, by taking the electric ſpark three hours in a ſmall quantity of fixed air, he obſerved that it was firſt increaſed, and then diminiſhed about one-eighth of the whole; the inſide of the tube being very black on the upper part, and below the mercury very yellow, for the ſpace of a quarter of an inch all round the tube; but this ſpace had been above the mercury in the beginning of the operation. One-third of the air remained unabſorbed by water; but ſo impure, that the ſtandard of it was 1.8, or almoſt completely phlogiſticated.—Varying the proceſs by uſing water impregnated with fixed air inſtead of mercury, the quantity of air was much augmented by that which came from the water; but thus the far greater part of it was incapable of being abſorbed by lime-water; and on this occaſion he obſerved, that water impregnated with fixed air is a much worſe conductor of electricity than the ſame fluid impregnated with mineral acids. On ſtill varying the circumſtances of the experiment, by uſing common water inſtead of that which had abſorbed fixed air, he found that the quality of the reſiduum was evidently better than that of the original fixed air.

115 Effects of a ſtrong heat on fixed air.

In order to diſcover whether the heat or light of the electric ſpark were the circumſtances which effected the change, the Doctor threw a ſtrong light, by means of a lens, for ſome hours, on a quantity of pounded glaſs confined in ſome fixed air; but though the volume of reſiduum was thus ſomewhat increaſed, yet as it was of the ſame quality with common air, he ſuſpected that it might be only that portion which had been introduced among the particles of the glaſs. The quantity of air was increaſed after the operation. With glaſs-houſe ſand made very hot, the quantity of air was likewiſe increaſed; but the experiment was not more ſatisfactory than the former. Heated bits of crucibles increaſed the quantity of reſiduum in the proportion of 10 to 6.6; but the quality was injured either directly by a compariſon with nitrous air, or by producing a larger quantity of reſiduum equally bad. By heating iron, however, in fixed air, part of it was evidently converted into phlogiſticated air. On heating turnings of malleable iron for ſome time in fixed air, one-tenth part of it was rendered immiſcible with water; and on repeating the proceſs with the remainder, there was a reſiduum of one-fourth of the whole. There was alſo a ſmall addition to the quantity of air after the firſt part of the proceſs, but none after the ſecond; nor could he, after a third and fourth proceſs, render more than one-fourth immiſcible with water. In two experiments, the reſiduum was inflammable, and burned with a blue flame.

116 Quantity of fixed air expelled from different ſubſtances.

With regard to the quantity of fixed air which may be expelled from different ſubſtances, Dr Prieſtley obſerves, that from ſeven ounces of whiting, the pureſt calcareous ſubſtance we are acquainted with, he expelled by heat 630 ounce-meaſures of air; by which means the whiting was reduced to four ounces. One third of this was ſomewhat phlogiſticated; the ſtandard being 1.36 and 1.38. Repeating the experiment, he obtained 440 ounce-meaſures of air from ſix ounces of whiting; about one-half of which was fixed air, and the remainder of the ſtandard of 1.4. On moiſtening ſome calcined whiting with water impregnated with vitriolic acid air, he obtained 90 ounce-meaſures; of which the firſt portions were three-fourths fixed air, and the ſtandard of the reſiduum 1.5; the latter had leſs fixed air, and the ſtandard of the reſiduum was 1.44. The whiting was rendered black and hard, but became ſoft and white with ſpirit of ſalt. Three ounces and a quarter of lime fallen in the air, yielded 375 ounce-meaſures; of which about one-fifth was fixed air, and the ſtandard of the reſiduum 1.4. Four ounces of white lead had yielded 240 meaſures of air when the retort melted. The reſiduum of the firſt proceſs was one-third, the ſtandard 1.36; and of the laſt the ſtandard was 1.28, that with the common atmoſphere being 1.23. Two ounces and three quarters of wood-aſhes yielded, in a very ſtrong heat, 430 ounce-meaſures of air; of the firſt portion of which one-tenth, of the ſecond one-third, and of the third one-half, was fixed

air

Fixed Air. air. The standard of the residuum of the first portion was 1.6, and of the second 1.7. It extinguished a candle; so that the air came properly from the ashes, and not from any remaining particles of the charcoal mixed with them. After the process, the ashes weighed 839 grains; but by exposure to the air for one day, the weight was increased to 842 grains; and, perhaps with more heat than before, yielded 50 ounce-measures of air; of which about one-eighth was fixed air, and the standard of the residuum 1.38 and 1.41. A candle burned in this residuum, and the ashes were reduced to 789½ grains. Two ounce-measures of Homberg's pyrophorus burned in the open air, and then distilled in a retort, yielded 144 ounce-measures of air; of which one-half at first was fixed air, but at the last very little. The residuum of the first portion extinguished a candle, but that of the last burned with a blue lambent flame. The standards of both with nitrous air were about 1.8. The pyrophorus was then kept two days in the retort, with the mouth immersed in mercury; after which, on being taken out, it burned as strong as ever. Immediately before the burning, it weighed 428 grains; immediately after it, 449: but being spread thin and exposed to the atmosphere for a night, the weight was increased to 828 grains; though, on being well dried, it was again reduced to 486. Subjecting it to a greater heat than before, the matter yielded 110 ounce-measures of air; the first portions of which were half fixed air, but the last contained very little, and burned with a blue lambent flame. It was then reduced to 396 grains. The experiment was then repeated with a quantity of pyrophorus, which would not take fire in the open air; and on heating this substance in an earthen retort, five-sevenths of the first part of the produce was fixed air: but this proportion gradually diminished; till at last nine-tenths of the whole was inflammable air, burning with a lambent blue flame. This inflammable air being decomposed with an equal quantity of dephlogisticated air, yielded 0.86 of a measure of fixed air. Another quantity of pyrophorus, which burned very well, and which by exposure to the atmosphere had gained 132 grains, being again exposed to heat in an earthen retort, gave 180 ounce-measures of air; three-sevenths of the first portion of which was fixed, and the rest phlogisticated air; but afterwards only one-half was fixed and the rest inflammable, burning with a lambent blue flame; and at last it was wholly inflammable. This pyrophorus took fire again after being poured out of the retort, but not without the assistance of external heat. It had been red-hot through the whole mass at the first burning, and the surface was covered with white ashes; but all the inside was as black as ever it had been. Four ounces of dry ox-blood yielded 1200 ounce-measures of air, and it was conjectured that not less than 200 measures had escaped. It contained no fixed air. The first portion burned with a large lambent white flame, the middle portion fainter, and the last was hardly inflammable at all. The remaining coal weighed 255 grains, and was a good conductor of electricity.

SECT. VI. *Inflammable Air.*

WE owe the knowledge of the existence, and of some remarkable properties, of this air, to Mr Cavendish, by whom they were first published in 1767. Its effects, however, had long before been fatally experienced by miners; in whose subterraneous habitations it is often collected in such quantities as to produce the most dreadful effects. It is produced in abundance from putrid animal and vegetable substances; and, in general, by all those which part with their phlogiston easily. Being much lighter than common air, it always rises to the top of those places where it is generated; so that it cannot be confined except in some vaulted place, but always strives to ascend and mix with the atmosphere. By itself it is very noxious, and will instantly put an end to animal life; but when mixed with atmospherical air, may be breathed in much greater quantity than fixed air. Its great inflammability in this state, however, renders it very dangerous to bring any lights, or even to strike a flint with steel, in those places where it abounds. But this only takes place when the inflammable air is mixed with common atmospherical or with dephlogisticated air; in which case, the explosion is much more violent than the former; for pure inflammable air extinguishes flame as effectually as fixed or phlogisticated air.

Inflammable Air.

117 Inflammable air produced in mines from putrid waters, &c.

Besides the subterraneous places already mentioned, this kind of air is found in ditches; over the surface of putrid waters, out of which it escapes; in burying-places; in houses of office, where putrid animal and vegetable matters are accumulated; and may, by standing or boiling, be extracted from the waters of most lakes and rivers, especially those in which great quantities of fermenting and putrefying matters are thrown: and as putrefaction thus seems to be the principal source of inflammable air, it thence happens, that much more of it is produced in warm than in cold climates. In those countries, we are informed by Dr Franklin, that if the mud at the bottom of a pond be well stirred, and a lighted candle brought near to the surface of the water immediately after, a flame will instantly spread a considerable way over the water, from the accension of the inflammable air, affording a very curious spectacle in the night-time. In colder climates, the generation of inflammable air is not so plentiful as to produce this phenomenon; nevertheless Mr Cavallo informs us, that it may be plentifully procured in the following manner, in all the ponds about London. "Fill a wide-mouthed bottle with the water of the pond, and keep it inverted therein; then, with a stick, stir the mud at the bottom of the pond, just under the inverted bottle, so as to let the bubbles of air which come out of it enter into the bottle; which air is inflammable. When by thus stirring the mud in various places, and catching the air in the bottle until this is filled, a cork or glass stopper must be put over it whilst standing in water; and then the bottle must be taken home, in order to examine the contained inflammable fluid at leisure."

118 Great quantities produced in hot climates.

119 Mr Cavallo's method of collecting inflammable air from ponds.

The great quantity of inflammable air produced in warm climates has given occasion to some philosophers to suppose, that it may possibly have some share in producing certain atmospherical meteors. The weak lightnings without any explosion, which are sometimes perceived near the horizon in serene weather, are by them conjectured to proceed from inflammable air fired by electric explosions in the atmosphere. Mr Volta supposes that the *ignes fatui* are occasioned by the inflammable air which proceeds from marshy grounds,

120 Meteors thought to proceed from it.

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grounds, and is set on fire by electric sparks: but these phenomena can be accounted for in a more probable manner from the action of the electric fluid itself.

This kind of air is more common than any of the other noxious airs; for there is hardly any inflammable substance on earth, out of which it may not be extracted by one means or other. The fluids, however, which go by the generel name of *inflammable air*, have scarce any other property in common to them all, besides those of inflammability, and being specifically lighter than the common atmospherical air. In other respects, the differences between them are very considerable. The smell, weight, power of burning, of preserving their properties, and the phenomena attending their combustion, are by no means the same in them all; some burning in an explosive manner; others quietly, and with a lambent flame of a white or blue colour. It is, however, necessary to make a proper distinction between an inflammable elastic fluid or inflammable gas, which may be properly called so, and that which is evidently made by combining an inflammable substance with common air; which being easily separable from the air, leaves that fluid in the state it was before. Thus a drop of ether, put into a quantity of common air, mixes itself with it, and takes fire on the approach of flame, like a mixture of inflammable and common air; but if the air to which ether is added be washed in water, the latter is soon separated from it. Common air becomes also inflammable by being transmitted through several essential oils; and thus the air contiguous to the plant called *fraxinella* becomes inflammable in calm and hot weather, by the emission of its inflammable air.

121 Differences among inflammable airs.

122 Extracted from various substances by heat.

By heat alone, a considerable quantity of this kind of air may be extracted from most inflammable substances, and even from some of the metals. Dr Hales obtained inflammable air by simply distilling wax, pitch, amber, coals, pease, and oyster shells; and Mr Fontana informs us, that he obtained a considerable quantity of inflammable air from spathose iron, by the action of fire only applied to it in a matrass. Dr Priestley, however, obtained it from a vast number of other substances, by distilling them in a gun-barrel; to the extremity of which was luted a tobacco-pipe, or small glass tube, with a flaccid bladder tied on the end. He observes, that the heat must be suddenly applied, in order to get a considerable quantity of air from these substances. "Notwithstanding (says he) the same care be taken in luting, and in every other respect, six, or even ten, times more air may be got by a sudden heat than by a slow one, though the heat that is last applied be as intense as that which was applied suddenly. A bit of dry oak, weighing about twelve grains, will generally yield a sheep's bladder full of inflammable air with a brisk heat, when it will only yield two or three ounce-measures if the same heat be applied gradually." When he wanted to extract inflammable air from metals, a glass was used, the focus of which afforded a more intense heat than any furnace he could apply: and in this way he obtained inflammable air from several metals; as iron, brass, and tin; but with the metallic calces he had no success.

123 More air procured by a sudden than gradual heat.

In the infancy of his experiments, and even after very considerable practice, the Doctor imagined, that the inflammable air produced in this way came only from the metal, without attending to the share which water had in the production. Some late experiments of Mr Lavoisier, however, showed, that water had a great share in the production of inflammable air; insomuch that it gave occasion to a supposition, that the water was the only source from whence it was derived. This mistake, however, was detected by Dr Priestley; who, by his numerous and accurate experiments, seems in a manner to have exhausted the subject. The method which Mr Lavoisier had followed, was to send the steam of boiling water through a red-hot iron tube; in doing which, the intense heat acquired by the water occasioned the production of a great quantity of inflammable air. Dr Priestley repeated his experiments not only with water, but with other fluids. Sending the vapour of two ounces of spirit of wine through a red-hot earthen tube, he obtained 1900 ounce-measures of inflammable air, which burned with a white lambent flame. It contained no fixed air; and 30 ounce-measures of it weighed eight grains less than an equal quantity of common air. He collected also 0.35 of an ounce-measure of water. In this experiment, the weight of the water collected was 168 grains, of the inflammable air 633 grains, and that of the spirit of wine originally was 821 grains; so that as little was lost in the process as could be expected.—Repeating the experiment with vitriolic ether, an ounce of it treated in the same manner in an earthen tube almost filled with pieces of broken earthen retorts and crucibles, one tenth part of an ounce of water was collected, and 740 ounce-measures of inflammable air were procured, without any mixture or fixed air, burning with a white lambent flame like that of wood, and not exploding with dephlogisticated air. Twenty-nine ounce-measures of this weighed five grains less than an equal quantity of common air. Vapour of spirit of turpentine yielded inflammable air mixed with much black smoke, which soon collected on the surface of the water in the receiver. The smell of this air was exceedingly offensive, and its flame was much less luminous than that of the former. Its specific gravity was the same with that of the air procured from spirit of wine. Olive oil yielded a considerable quantity of air on being mixed with calcined whiting; the first portions burning with a large white flame, and the last with a lambent blue one.

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124 How procured from water and other fluid and solid substances.

In extracting air from solid substances, the steam of water was always necessary; and thus inflammable air was produced from a great number of different ones. From sulphur treated in this manner in an earthen tube, inflammable air was obtained of a nature similar to that from oil of vitriol and iron. From arsenic, the produce was one-seventh of fixed air; but all the rest strongly inflammable, with a smell scarcely distinguishable from that of phosphorus. Twenty ounce-measures of this air weighed $4\frac{1}{2}$ grains less than an equal quantity of common air. Both these experiments, however, were very troublesome, on account of the volatility of the matters, which sublimed and choaked up the tubes. From two ounces of the scales of iron, or *fining cinder*, which he has found to be the same thing, Dr Priestley obtained 580 ounce-measures of air; one-tenth of the first part of which was fixed air, but afterwards it was all inflammable.

Forty

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Forty ounce measures of this air weighed two grains more than an equal quantity of common air. From charcoal exposed to the red-hot steam of water, inflammable air was procured in great quantities. From ninety-four grains of perfect charaoal, that is, prepared with a strong heat so as to expel all fixed air from it, and 240 ounces of water, 840 ounce-measures of air were obtained, one-fifth part of which was fixed air; and the inflammable part appeared likewise, by decomposition, to have a quantity of fixed air intimately combined with it.—Three ounces of bones burnt black, and treated in this manner in a copper tube, yielded 840 ounce-measures of air; the water expended being 288 grains, and the bones losing 110 grains of their weight. This air, he observes, differs considerably from that of any other kind of inflammable air; being in several respects a medium betwixt the air procured from charcoal and that from iron. It contains about one-fourth of its bulk of uncombined fixed air, but not quite one-tenth intimately combined with the remainder. The water that came over was blue, and pretty strongly alkaline; owing to the volatile alkali not having been totally expelled by the heat which had reduced the bones to blackness.

A variety of substances, said not to contain any phlogiston, were subjected to the same process, but without yielding any inflammable air. The experiments with iron, however, were the most satisfactory, as being subject to less variation than those with charcoal; and clearly evincing, that the air in the process does not come from the water alone, but from the iron also; or, as Dr Priestley says, "only from the iron; the weight of water expended, deducting the weight of air produced, being found in the addition of weight in the iron as nearly as could be expected in experiments of this kind. And though the inflammable air procured in this process is between one-third and one-half more than can be procured from iron by solution in acids, the reason may be, that much phlogiston is retained in the solutions; and therefore much more may be expelled from iron when pure water, without any acid, takes place of it. The produce of air, and likewise the addition of weight gained by the iron, are also much more easily ascertained in these experiments than the quantity of water expended in them; on account of the great length of the vessels used in the process, and the different quantities that may perhaps be retained in the worm of the tub.

125 Proportions of inflammable air obtained from iron by means of steam.

The following are the results of some of the Doctor's experiments.——Two hundred and sixty-seven grains, added to the weight of a quantity of iron, produced a loss of 336 grains of water, and an emission of 840 ounce-measures of air; and in another experiment, 140 grains added to the weight of the iron produced a loss of 240 grains of water, and the emission of 420 ounce-measures of air. "The inflammable air produced in this manner (says he) is of the lightest kind, and free from that very offensive smell which is generally occasioned by the rapid solution of metals in oil of vitriol; and it is extricated in as little time in this way as it is possible to do it by any mode of solution. The following experiment was made with a view to ascertain the quantity of inflammable air that may be procured in this manner from any given quantity of iron. Nine hundred and sixty grains of iron, when dissolved in acids, will yield about 800 ounce-measures of air; but, treated in this manner, it yielded 1054 measures, and then the iron had gained 329 grains in weight" (A).

126 Of the constituent principles of inflammable air.

Inflammable air having been at first produced only from metals by means of acids, it was then supposed that part of the acid necessarily enters into its composition; but this hypothesis is now found to be ill grounded. "That no acid (says Dr Priestley), is necessarily contained, or at least in any sensible quantity, either in inflammable air, though produced by means of acids, or in the dephlogisticated air of the atmosphere, is evident from the following experiment, which I made with the greatest care: Taking a bason which contained a small quantity of water tinged blue with the juice of turnsole, I placed it in a bent tube of glass, which came from a vessel containing iron and diluted oil of vitriol; and lighting the current of inflammable air as it issued from this tube, so that it burned exactly like a candle, I placed over it an inverted glass jar, so that the mouth of it was plunged in the liquor. Under this jar the inflammable air burned as long as it could; and when extinguished for want of more pure air, I suffered the liquor to rise as high as it could within the jar, that it might imbibe whatever should be deposited from the decomposition of either of the two kinds of air. I then took off the jar, changed the air in it, and, lighting the stream of inflammable air, replaced the jar as before. This I did till I had decomposed a very great quantity of the two kinds of air, without perceiving the least change in the colour of the liquor, which must have been the case if any acid had entered as a necessary constituent part into either of the two kinds of air. I also found no acid whatever in the water, which was procured by keeping a stream of inflammable air constantly burning in a large glass balloon, through which the air could circulate, so that the flame did not go out. Neither was there any acid produced in the decomposition of inflammable and dephlogisticated air in a strong close glass vessel.

127 No acid contained in it.

"With respect to inflammable air, I have observed, that when sufficient care is taken to free it from any acid vapour that may be accidentally contained in it, it is not in the smallest degree affected by a mixture of alkaline air. On the whole, therefore, I have at present no doubt, but that pure inflammable air, though it certainly contains *water*, does not necessarily contain any

(A) In these experiments, the Doctor seems not to have supposed that any particular kind of water was necessary for this production of inflammable air: but in the Memoirs of the Philosophical Society at Haerlem, it is asserted by Dr Deiman and M. Paets Van Trooftwyk, that the experiment will not succeed when boiled or distilled water, or any other than that containing fixed air, is made use of; and to this air they attribute the calcination of the iron and production of inflammable air. This assertion, however, is contrary to what we find related by Mr Kirwan. See n° 138.

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any acid: yet an acid vapour may be eaſily diffuſed through it, and may perhaps in many caſes be obſtinately retained by it, as no kind of air ſeems to be capable of ſo great a variety of impregnations as inflammable air is."

128 Water neceſſary to its production.

Mr Cavendiſh firſt perceived the neceſſity of moiſture to the production of inflammable air; but it was not until after making ſeveral experiments that Dr Prieſtley could adopt the ſame idea. He had obſerved ſome very remarkable circumſtances relating to the production of inflammable air from charcoal, by which he was induced to ſuppoſe that the former was pure phlogiſton in a volatile ſtate without any moiſture whatever.

129 Charcoal totally convertible into inflammable air.

The Doctor obſerves, that "charcoal is generally ſaid to be indeſtructible, except by a red heat in contact with air. But I find (ſays he), that it is perfectly deſtructible, or decompoſed, *in vacuo*, and, by the heat of a burning lens, almoſt convertible into inflammable air; ſo that nothing remains beſides an exceedingly ſmall quantity of white aſhes, which are ſeldom viſible, except when in very ſmall particles they happen to croſs the ſun-beams as they fly about the receiver. It would be impoſſible to collect or weigh them; but, according to appearance, the aſhes thus produced, from many pounds of wood, could not be ſuppoſed to weigh a grain.

130 Weight of aſhes derived from the air.

The great weight of aſhes produced by burning wood in the open air ariſes from what is attracted by them from the air. The air which I get in this manner is wholly inflammable, without the leaſt particle of fixed air in it. But in order to this, the charcoal muſt be perfectly well made, or with ſuch a heat as would expel all the fixed air which the wood contains; and it muſt be continued till it yield inflammable air only, which, in an earthen retort, is ſoon produced.

"Wood or charcoal is even perfectly deſtructible, that is, reſolvable into inflammable air, in a good earthen retort, and a fire that would about melt iron. In theſe circumſtances, after all the fixed air had come over, I ſeveral times continued the proceſs during a whole day; in all which time inflammable air has been produced equably, and without any appearance of a termination. Nor did I wonder at this, after ſeeing it wholly vaniſh into inflammable air *in vacuo*. A quantity of charcoal made from oak, and weighing about an ounce, generally gave me about five ounce-meaſures of inflammable air in twelve minutes."

131 Experiment ſhowing the neceſſity of water to the production of inflammable air.

Although from theſe experiments it did not appear that water was in any way eſſentially neceſſary to the production of this kind of inflammable air, it appeared manifeſtly to be ſo in the following: "At the time (ſays he) when I diſperſed any quantity of charcoal with a burning lens *in vacuo*, and thereby filled my receiver with nothing but inflammable air, I had no ſuſpicion that the wet leather on which my receiver ſtood could have any influence in the caſe, while the piece of charcoal was ſubject to the intenſe heat of the lens, and placed ſeveral inches above the leather. I had alſo procured inflammable air from charcoal in a glazed earthen retort for two whole days ſucceſſively, during which it continued to yield it without intermiſſion. Alſo iron-filings in a gun-barrel, and a gun-barrel itſelf, had always given inflammable air whenever I tried the experiment. Theſe circumſtances, however, deceived me, and perhaps would have deceived any other perſon; for I did not know, and could not have believed, the powerful attraction between water and charcoal or iron, when the latter are intenſely hot.

132 Exceſſive attraction betwixt charcoal, or iron and water.

They will find, and attract it, in the midſt of the hotteſt fire, and through any pores that may be left open in a retort; and iron-filings are ſeldom ſo dry as not to have as much moiſture adhering to them as is capable of enabling them to give a conſiderable quantity of inflammable air. But my attention being now fully awakened to the ſubject, I preſently found that the circumſtances above mentioned had actually miſled me; I mean with reſpect to the concluſion which I drew from the experiments, and not with reſpect to the experiments themſelves, every one of which will, I doubt not, be found to anſwer, when properly tried.

"Being thus appriſed of the influence of unperceived moiſture in the production of inflammable air, and willing to aſcertain it to my perfect ſatisfaction, I began with filling a gun-barrel with iron-filings in their common ſtate, without taking any particular precaution to dry them, and I found that they gave air as they had been uſed to do, and continued to do ſo many hours: I even got ten ounce-meaſures of inflammable air from two ounces of iron-filings in a coated glaſs retort: At length, however, the production of inflammable air from the gun-barrel ceaſed; but, on putting water to it, the air was produced again; and

133 Inflammable air is not pure phlogiſton.

a few repetitions of the experiment convinced me that I had been too precipitate in concluding that inflammable air is pure phlogiſton. I then repeated the experiment with the charcoal, making the receiver, the ſtand on which I placed the charcoal, and the charcoal itſelf, as dry and hot as poſſible, and uſing cement inſtead of wet leather, in order to exclude the air. In theſe circumſtances I was not able, with the advantage of a good ſun and an excellent burning lens, to decompoſe quite ſo much as two grains of the piece of charcoal which gave me ten ounce-meaſures of inflammable air; and this, I imagine, was effected by means of ſo much moiſture as was depoſited from the air in its ſtate of rarefaction, and before it could be drawn from the receiver. To the production of this kind of inflammable air, therefore, I was now convinced that water is as eſſential as to that from iron."

134 Prieſtley's analyſis of different kinds of inflammable air.

In his analyſis of different kinds of inflammable air, the Doctor obſerves, that the difference moſt commonly perceived is, that ſome of them burn with a lambent flame, ſometimes white, ſometimes yellow, and ſometimes blue; while another kind always burns with an exploſion, making more or leſs of a report when a lighted candle is dipped into a jar filled with it. The inflammable air extracted from metals by means of acids is of this laſt kind; and that from wood, coal, or other inflammable ſubſtances by means of heat, belongs to the former. It has alſo been obſerved, that theſe kinds of inflammable air have different ſpecific gravities; the pureſt, or that which is extracted from iron, &c. being about ten times as light as common air; but ſome of the other kinds not more than twice as light (A).

This difference was for ſome time attributed to a quantity

(A) Here the Doctor's calculation differs ſomewhat from that of Mr Kirwan; who, in his Treatiſe on Phlogiſton,

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quantity of fixed air intimately combined with the heavier kinds, so that it could not be discovered by lime-water, while the lightest contained no fixed air at all. In order to ascertain this point, he had recourse to decomposition; which was performed by mixing with the inflammable air to be tried an equal quantity of common or dephlogisticated air, and then confining them in a strong glass vessel previously filled either with water or mercury; making afterwards an electric spark in some part of the mixture by means of wires inserted through the sides of the vessel, and nearly meeting within it. Thus he supposed that he might be able to determine the quantity of *combined* fixed air, and likewise the relative quantity of phlogiston contained in each of them. The former appeared by washing the air with lime-water after the explosion, and observing how much of them was observed; and the latter by examining the residuum with the test of nitrous air, and observing the purity of it. Finding, however, that, in some cases, more fixed air was found after the explosion than could have been *contained* in the inflammable air, he was thence led to observe the *generation* of fixed air from the principles mentioned in the last section.

135 Fixed air generated in the decomposition of inflammable air.

In prosecuting this subject, it was found, that one measure of inflammable air produced by steam from metals, and one of dephlogisticated air, such as by mixture with two measures of nitrous air was reduced to 0.72 of a measure, were reduced by explosion to 0.6 of a measure; the residuum, by an equal quantity of nitrous air, was reduced to 0.87. With the same dephlogisticated air, the inflammable air from finingcinder and charcoal was reduced only to 1.85 of a measure; but by washing in lime-water, to 1.2. The residuum examined by nitrous air appeared to be of the standard of 0.9. In another process, the diminution after the explosion was to 1.55, and that after washing in lime-water to 0.65, of a measure; in a third, by explosion to 1.6, and by washing to 0.66; and in a fourth, the first diminution was to 1.6, and the second to 0.6. In this last experiment there was a generation of an entire measure of fixed air; and that this had not been contained originally in any latent state in the original fluid, was evident from the specific gravity of the inflammable air made use of. This, indeed, was one of the heaviest kinds of the fluid: but 40 ounce-measures of it weighed only two grains more than an equal bulk of common air; whereas, had all the fixed air found in the residuum been *contained* in the original air, it must have been at least one-half heavier. "Indeed (says the Doctor) if any quantity of inflammable air, of about the same specific gravity with common air (which is the case with that species of it I am now considering), yield so much as seven-tenths of its bulk of fixed air in consequence of its explosion with dephlogisticated air, it is a proof that at least part of that fixed air was generated in the process, because seven-tenths of such fixed air would weigh more than the whole measure of inflammable air."

Equal parts of dephlogisticated air and the inflammable kind produced from spirit of wine, were reduced to one measure, and by washing in lime-water to 0.6 of a measure. The standard of the residuum was 1.7.—In another experiment, in which the vapour of the spirit of wine had passed through a tube filled with bits of crucibles, the first diminution was to 1.6, the second to 1.4, and the standard of the residuum was to 1.84: but in a third, the first diminution was to 1.2, the second to 0.9.—Air procured by steam from red-hot platina was reduced to 0.72 of a measure, and the standard of the residuum was 0.9. It contained no fixed air.—Air from brimstone, with an equal part of dephlogisticated air, was diminished to 0.6, and no fixed air was found in the residuum. Its standard was 0.95.—With inflammable air from arsenic, the first reduction was to 1.15, the second to 0.95. The standard was 0.82.—With the inflammable air procured by a decomposition of alkaline air, the diminution by explosion was to 0.96, and no fixed air was contained in the residuum; the standard of which was 0.8.—Inflammable air from ether resembles that from spirit of wine. The first diminution was to 1.36, the second to 1.2; and the standard was 1.9.

Inflammable air procured by means of steam from charcoal of metals produces a considerable quantity of fixed air; the first diminution being to 1.12, the second to 0.8, and the standard of the residuum 1.9. This analysis was of the first portion that came over, the second was somewhat different; the first diminution being to 1.0, the second to 0.75, and the standard of the residuum 1.9.—From *coak*, or the charcoal of pitcoal, the first diminution was to 1.15, the second to 0.95, and the standard 1.9; but the dephlogisticated air in this experiment was by no means pure.

With inflammable air from spirit of turpentine, the first diminution was to 1.7, the second to 1.6, and the standard 1.9—From bones, the first diminution was to 0.67, the second to 0.58; the standard 1.47.—From common charcoal, the first diminution was to 1.5, the second to 0.74, and the standard 1.7. In another experiment, the first diminution was to 0.82, the second to 0.63, and the standard of the residuum 1.37.

Inflammable air procured by distilling some rich mould in a gun-barrel had a very offensive smell, like that procured from putrid vegetables; it contained one-twentieth part of uncombined fixed air. When this was separated from it, and the remainder decomposed with dephlogisticated air, the first diminution was to 1.4, the second to 0.67, and the standard of the residuum was 0.6.—The air procured from cast-iron has likewise a peculiarly offensive smell; and, on this account, the Doctor imagined, that it might contain more phlogiston than common inflammable air, so as to absorb more dephlogisticated air than the other. But this conjecture did not appear to be well founded; for on exploding it with dephlogisticated air in the proportions

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giston, informs us, that in his experiments he used "inflammable air extracted from clean newly-made filings of soft iron, in the temperature of 59°, by vitriolic acid whose specific gravity was 1.0973, and obtained over mercury, having very little smell, and what it had being very unlike the usual smell of inflammable air."—The weight of this air, when the barometer stood at 29.9, and the thermometer at 60°, was found to be to that of common air as 84.3 to 1000; and, consequently, near 12 times lighter.

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proportions already mentioned, the diminution was the same as with inflammable air produced from the malleable kind, viz. 1.56.

In these experiments, it seemed evident, that at least part of the fixed air found after the explosion was produced by its means; but the following seem no less convincing proofs, that fixed air may be converted into the inflammable kind, or at least that the elements of fixed air may remain in inflammable air in such a manner as to be imperceptible. On heating in an earthen retort a quantity of slaked lime, which had long been kept close corked in a bottle, it gave air, of which one-fifth was generally fixed air; but in the gun-barrel the same lime yielded no fixed air at all, but a great quantity of inflammable air of the explosive kind, like that which is got from iron alone by means of water. As this total disappearance of the fixed air appeared extraordinary, the Doctor was induced to repeat it several times with all possible care; and the following was the result of his experiments: Three ounces of slaked lime, which had for some time been exposed to the open air, heated in an earthen tube, yielded 14 ounce-measures of air, of which only two and an half remained unabsorbed by water; the residuum was slightly inflammable, but not perfectly phlogisticated. Three ounces of the same lime, heated in a gun-barrel, gave 20 ounce-measures of air, all of which was inflammable, and no part fixed. It was expected, however, that the fixed air would have appeared on the decomposition of this inflammable air with the dephlogisticated kind: but after this process, it appeared to be exactly such inflammable air as is procured from metals by the mineral acids, or by steam; the diminution of the two kinds of air being exactly the same: and tho' some fixed air was found in the residuum, it was no more than is usually met with in the decomposition of inflammable air procured by means of spirit of salt.—Supposing that the two kinds of air might incorporate, when one of them was generated within the other, a gun-barrel was filled with fixed air, and the closed end of it put into a hot fire. Inflammable air was instantly produced; but when the fixed air was separated from it, it burned like inflammable air with which no other kind had ever been mixed.

136 Fixed air convertible into inflammable air.

On heating iron-turnings in five ounce-measures of fixed air, the quantity of it was increased about one ounce-measure, and there remained one and three-fourths unabsorbed by water. The experiment was repeated with the same result; and it was farther observed, that though the inflammable air procured in this manner did not appear by the test of lime-water to contain any fixed air, yet when it was decomposed by firing it with an equal quantity of dephlogisticated air, the residuum contained one-third of fixed air. The diminution was to 1.45. Hence the Doctor conjectures, that though, in some cases, the fixed air appears to be *generated* by the decomposition of dephlogisticated and inflammable air, yet that inflammable air, when thus produced in contact with fixed air, may *combine* with it, so as to be properly *contained* in it, and in such a manner that it cannot be discovered by lime-water.

Inflammable air, when produced in the driest way possible, is exceedingly light, as has been already observed: but Dr Priestley has found, that by standing on water, a very considerable increase is made in its specific gravity; so that from being ten or twelve times lighter than atmospherical air, it soon becomes only seven times lighter. This great propensity to unite with water is also taken notice of by Mr Kirwan; who tells us, that the bulk of innflammable air obtained over water with the assistance of heat towards the end, was one-eighth greater than when produced over mercury; but that the weight of it in the former case was only eight or nine times less than common air.——"From 85 cubic inches of inflammable air obtained over water, I extracted," says he, "by oil of vitriol exposed to it for 55 hours, two grains of water; and, though undoubtedly there is an error in all these experiments, yet there can be little doubt but this inflammable air contained one-half its weight of water. The inflammable air, by the subtraction of its water, lost its smell, but continued as inflammable as ever; and therefore there is no reason to think that it was decomposed, or that water is any way essential to it."

137 Great propensity of inflammable air to unite with water.

This conclusion is directly contrary to that of Dr Priestley, that *water* is an essential ingredient in the composition of inflammable air; nor do the experiments of the latter, already recited, seem to have had any weight with him, as he concludes his Treatise on Phlogiston in these words. "To the proofs I have heretofore given, that inflammable air and phlogiston are the same substance, just as ice and the vapour of water are called the same substance, no objection of any weight has since been made. Some have thought that I should have included the matter of heat or elementary fire in the definition of inflammable air: but as fire is contained in all corporeal substances, it is perfectly needless, except where bodies differ in the quantity of it they contain; and in this respect I expresly mentioned its difference with phlogiston to consist.—Others, attending to the quantity of water contained in inflammable air, have supposed it to be an essential ingredient in the composition of this air, and have called it *phlogisticated water;* but they may as well suppose water to be an essential ingredient in common air, or fixed air, and call this last *acidulated water:* for inflammable air, equally as other airs, may be deprived of its water without any limitation, and yet preserve all its properties unaltered; which shows the presence of water to be no way essential to it. Lastly, others have thought, that it essentially requires an acid or an alkali, or some saline substance, for its basis; as if there were any more repugnance in the nature of things, that phlogiston should exist in an aërial state without any basis, than marine air, alkaline air, or dephlogisticated air; when it is evident, that an aërial state requires no more than a certain proportion of latent heat: but the production of inflammable air from iron by means of distilled water, without any acid or salt, has effectually done away any suspicion of that sort."

138 Mr Kirwan's conclusion concerning the principles of inflammable air.

On the other hand, Dr Priestley informs us, that "inflammable air seems now to consist of water and inflammable air: which, however, seems extraordinary, as the two substances are hereby made to involve each other; one of the constituent parts of water being inflammable air, and one of the constituent parts of inflammable air being water; and therefore, if the experiments would favour it (but I do not see that they do so),

139 Dr Priestley's conclusion.

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so), it would be more natural to suppose, that water; like fixed air, consists of phlogiston and dephlogisticated air, in some different mode of combination.

"There is an astonishing variety in the different kinds of inflammable air, the cause of which is very imperfectly known. The lightest, and therefore probably the purest kind, seems to consist of phlogiston and water only. But it is probable that *oil*, and that of different kinds, may be held in solution in several of them, and be the reason of their burning with a lambent flame, and also of their being so readily resolved into fixed air when they are decomposed by dephlogisticated air; though why this should be the case, I cannot imagine.

"When inflammable and dephlogisticated air are burned together, the weight of the water produced is never, I believe, found quite equal to that of both kinds of air. May not the *light*, therefore, emitted from the flame, be part of the phlogiston of the inflammable air united to the principle of heat? And as light accompanies the *electric spark*, may not this also be the real *accension* of some phlogistic matter, though it is not easy to find the source of it?"

The French chemists, who deny the existence of phlogiston, are of opinion, that inflammable air is a simple uncompounded element; but for a more full discussion of this subject, see the article PHLOGISTON.

140 Absorption of inflammable air by water.

Inflammable air is absorbed by water in considerable quantity, but by the application of heat may be expelled again in equal quantity. By agitation in water Dr Priestley was formerly of opinion that this kind of air might be rendered as good as common air; but this undoubtedly proceeds from the atmospherical air transmitted by the water, as is the case with phlogisticated air mentioned in the last section. After a quantity of water, which had absorbed as much inflammable air as it could, had been suffered to stand a month, it was expelled by heat, and found to be as strongly inflammable as ever. The water, after the process, deposited a kind of filmy matter; which he supposed to be the earth of the metal that had been employed in producing it.

141 Its effects on vegetation and animal life.

Plants in general grow tolerably well in inflammable air, and the willow plant has been observed to absorb great quantities of it. Its inflammability is not diminished by the putrefaction of animal substances, nor does their putrefaction seem to be retarded by it. Animals confined in it are killed almost as soon as in fixed air: but insects, which can live a considerable time in phlogisticated air, live also a considerable time in this kind of air; but at last they become torpid, and appear to be dead, though they will still recover if removed into the open air. Mr Cavallo relates, that the Abbé Fontana, having filled a large bladder with inflammable air, began to breathe it in his presence; after having made a very violent expiration, in which case the effects are most powerful. The first inspiration produced a great oppression in his lungs, the second made him look very pale, and the third was scarce accomplished when he fell on his knees through weakness. Birds and small quadrupeds, inclosed in small vessels of this air, died after a very few inspirations. Lastly, inflammable air appears to have a smaller share of refractive power than common air; for Mr Warltire informs us, that having placed an hollow triangular prism, of which the angle was 72 degrees, so as to half cover a large object-glass in one of Mr Dollond's perspectives, and so turned round as to make the frame of a window, at the distance of 1280 feet, seen partly through the prism and partly through common air, appear undivided. The inflammable air was then blown out of the prism, but no part of the apparatus was moved; when the frame of the window seen through the object-glass and the prism as before, seemed to separate about four inches.

142 Has little refractive power.

143 Schemes to employ it for various purposes.

The inflammability of this species of air has given occasion to various projects concerning it; such as that of employing it to give light and heat; and lamps have been described, which may be lighted by the electric spark in the night-time. By its means also very pretty artificial fires are made, with glass tubes bent in various directions, and pierced with a great number of small apertures. The inflammable gas is introduced into these tubes, from a bladder filled with that fluid, and fitted with a copper cock. When the bladder is pressed, the inflammable air, being made to pass into the tube, issues out of all the small apertures, and is set on fire by a lighted taper. None of these contrivances, however, have ever been applied to any use; and the scheme of Mr Volta, who proposed to substitute its explosive force instead of gun-powder, is found insufficient, on account of the weakness of the explosion, except when the two airs are fired in very great quantity, which would be incompatible with the small bulk necessary for warlike engines.

SECT. VII. *Sulphurated Inflammable Air.*

144 First procured from manganese.

THIS was discovered by Dr Priestley at the time when he was engaged in the experiments of which some account has been given in the last section, of transmitting the steam of water and other fluids through red-hot tubes containing some solid material. Having, among others, treated manganese in this manner, by stopping one end of the heated tube with a cork before the steam was applied, he received forty ounce-measures of air, of which one-sixth was fixed air and the rest of the standard of 1.7, lambently inflammable. Having then opened the other end of the tube in order to admit the steam, air was produced more copiously than before. Of 50 ounces of this air, one-seventh was fixed, and the rest, of the standard of 1.8, explosively inflammable. The last portions were very turbid; and the smell, especially that of the last portion, was very sulphureous, tinging the water of a very dark colour, by depositing in it a quantity of blackish water. However, the air itself became presently transparent, and had no other appearance than that of any other kind of air. On looking at the jar in about ten minutes after, it was quite black and opaque; so that nothing could be seen in the inside of it. Filling afterwards another jar with the same kind of air, in order to observe the progress of this uncommon phenomenon, he found, that when the water was well subsided, black specks began to appear in different places, and, extending themselves in all directions, at length joined each other, till the whole jar was become perfectly black, and the glass opaque. When this was done, he transferred the air into another jar; and it soon produced a similar effect upon this, though it never became so

Inflammable Air.

so black as the jar in which it had been first received. It also frequently happened, that only the lower part of the jar would become black, as if the matter with which it was loaded had kept subsiding, though invisibly, in the mass of air, and occupied only the lower regions, leaving the upper part entirely free from it. On exposing to the open air the vessels thus turned black, the colour presently disappeared, and a yellow or brown incrustation was left upon it. The same change took place when the vessels were inverted in water, in order to observe the alteration of the air within them; but on examining this air, no sensible change was perceived. In some cases, indeed, he thought the air was injured, but it was much less so than he had expected. After depositing the black matter, the air still retained its sulphureous smell, and he did not imagine that it would ever leave it entirely.

145 Procured from ivory melted in vitriolic acid air.

On trying other specimens of manganese, no air of this kind was obtained; but some time after, having occasion to make a large quantity of inflammable air, he used, instead of fresh iron, some that had been already melted in vitriolic acid air. Dissolving this with a considerable quantity of fresh metal in diluted vitriolic acid, he found that the water in which the air was received became very black, and deposited more sediment than had appeared in the experiment with the manganese. The jars were as black as ink, but became yellow on exposure to the air as before; so that there could be no doubt of its being the same thing he had got before. On burning a quantity of it, this kind of air appeared to contain some vitriolic acid, the balloon being filled with a very dense white fume, which rendered the water sensibly acid to the taste. On decomposing it with dephlogisticated air, however, he found the diminution exactly the same as when common inflammable and deplogisticated air were used; so that it appeared to contain neither more nor less phlogiston than the other; only there was a small quantity of fixed air produced, which is never the case with common inflammable air from vitriolic acid and iron.

When the sulphurated inflammable air is received over mercury, very little black matter is produced on the jars; and it is remarkable, that though the black matter collected on them, when the air is taken through water, soon grows yellow upon exposing it to the air, it is not the case with that which remains in the water; it adheres to the evaporating vessel in form of a black incrustation, which does not burn blue until it has been digested in the nitrous acid, which deprives it of its superfluous phlogiston, and leaves it both of the colour and smell of sulphur.

Sect. VIII. *Of Alkaline Air.*

This was procured by Dr Priestley, in the beginning of his experiments, from common spirit of sal-ammoniac with quicklime, or the materials from which it is made. He did not at that time prosecute the discovery farther than by impregnating water with it; by which means he could make a much stronger alkaline spirit than any to be met with in the shops. His method of procuring it was by mixing one part of pounded sal-ammoniac with three parts of slacked lime; and for common experiments the same quantity of materials would last a considerable time.

Alkaline Air.

This kind of air, when pure, is instantly fatal to animal life, and extinguishes flame; though, when mixed with common atmospherical air, it is slightly inflammable, and also medicinal in faintings and other cases of debility. A candle dipped into a jar of this air is extinguished; but just before the flame goes out, it is enlarged by the addition of another flame of a pale yellow colour, and sometimes a weak flame spreads for a considerable way, or even through the whole body of the alkaline air. The electric spark taken in it appears of a red colour. Every spark taken in it augments its bulk, and by degrees turns the whole into inflammable air. It is readily absorbed by water, as has been already observed, and dissolves ice almost as fast as an hot fire. On confining some water impregnated with alkaline air in a glass tube, and thus exposing it to a strong heat in a sand-furnace for some days, he observed that a white sediment or incrustation was formed on the surface. The Doctor remarked, that bits of linen, charcoal, and sponge, admitted into a quantity of alkaline air, diminished it, and acquired a very pungent smell; especially the sponge, a bit of which, about the size of an hazle-nut, absorbed an ounce-measure. It is remarkable that copper, which is so easily corroded by the common volatile alkalis, is not affected by alkaline air. The specific gravity of this kind of air is, by Mr Kirwan, determined to be to that of common air as 600 to 1000; though, as he justly observes, this must differ very considerably according to the quantity of moisture it contains. 146 Properties of alkaline air.

147 Proofs of its containing phlogiston.

In prosecuting his experiments on alkaline air, Dr Priestley concluded that it contains phlogiston, both from its being convertible into inflammable air by electric explosions, and likewise from its reviving the calces of metals. In attempting to ascertain the quantity of lead revived in alkaline air, he met with two difficulties; the first, on account of some part of the calx being blackened and imperfectly revived; the second, that the lead completely revived was dissolved by the mercury employed to confine the air. To prevent this last inconvenience, he put the powdered massicot (the substance he chose to employ on this occasion) into small earthen cups, contriving to place them with their mouths upwards, in such a manner, that when the lead was revived by means of a burning lens, it would remain in the cup, and not mix with the mercury which supported it. The proportions of metal then revived, were six grains of lead in three ounce-measures, $16\frac{1}{2}$ in three measures and an half, 13 in two and an half, and 12 in three and three-fourths; but the experiment on which he laid the greatest stress, was that in which $26\frac{1}{2}$ grains of lead were revived in $7\frac{1}{2}$ ounce-measures of alkaline air. In this proportion, 100 ounce-measures of alkaline air would revive 352 grains of lead; but an equal quantity of inflammable air from iron would have revived 480 grains of metal. This deficiency appeared somewhat surprising to the Doctor, considering that alkaline air is resolved into more than twice its bulk of the inflammable kind; though it is possible, that inflammable air from iron may contain more phlogiston than that into which alkaline air is resolvable.

On heating red precipitate in alkaline air, the mercury was revived as in other cases, and a considerable quantity of water was produced, though none appear-

Alkaline Air.

on reviving it with common inflammable air. "It has even (says he) run down in drops in the inside of a vessel which contained five ounce-measures of the air; and a considerable quantity of dephlogisticated air was found in the residuum." On throwing the focus of the lens on red precipitate, inclosed in this kind of air, till three measures of it were reduced to two, water was produced as usual, and the standard of the residuum was 1.7. In another experiment, a violent explosion took place before he could observe whether any water was produced or not.

148 Conversion of alkaline into inflammable air.

In examining the phenomena which attend the conversion of alkaline air into the inflammable kind, the Doctor was induced to believe that it was occasioned by heat alone, without the concurrence of light. The effects of the former were first perceived on heating some ochre of iron in alkaline air; when, though the matter turned black, as in an incipient reduction of the metal, he found a considerable increase of quantity instead of decrease in the air, as he had expected; and, on examining the quality of it, he found that it contained no fixed air, but was entirely inflammable. With scales of iron a similar enlargement was perceived; but in this way he could never increase the quantity to more than double that which had been originally employed, and even after this the whole smelled strongly of volatile alkali; the iron had undergone no change.

The Doctor now, concluding from these experiments that the change of alkaline into inflammable air was produced by this cause alone, proceeded to repeat the experiment, by heating in the alkaline air bits of dry crucibles, or of earthen retorts, which had been just before exposed to very great heats, so that they could not be supposed to give out any air themselves, and therefore could only serve to communicate a strong heat to the alkaline air; and in these experiments the result was the same as when ochre and iron were made use of. The bits of white earthen ware were always turned black; but finding the same effect of augmenting the air and giving it an inflammable quality, though he used the bit of crucible over and over again, he was thoroughly convinced that the change was effected by heat alone.

In all these experiments, however, with a burning-glass, as a strong light was also concerned, he heated a quantity of alkaline air in a green glass retort, receiving in a glass tube, filled with water, all the air that could be expelled from it by heat. At first it was all absorbed by the water, being merely alkaline air expelled by the rarefaction; but when the bulb of the retort became red-hot, he found that the bubbles driven out were not wholly absorbed, and at last none of them were so. These were altogether inflammable; so that no doubt remained of the change being produced by heat alone, without any intervention of light.

It was farther observed, that whenever the alkaline air was changed into inflammable by means of bits of retorts or crucibles containing clay, they always became black during the process. He inclined therefore to suppose, that something might be deposited from the air which might attach itself to the clay. "Indeed, (says he) if this was not the case, I do not see why the clay should become black; though, perhaps, part of the same phlogiston which forms the inflammable air may be attracted by the red-hot clay, without there being any proper decomposition of the air. Nitrous Air.
That this is the case seems probable from an experiment in which I used porcelain instead of common earthen ware; which did not become black in the process, though inflammable air was produced."

149 Volatile alkali produced from nitrous air and iron.

In some of Dr Priestley's experiments, he had observed that iron, which had long rusted in nitrous air, gave out a strong smell of volatile alkali. This extraordinary phenomenon, however, was only perceived where the nitrous air and iron had been in contact for a very long time; but he found that it was much sooner produced by making use of a weak solution of copper; by putting iron into which he obtained that species of nitrous air called *dephlogisticated*. A phial containing some of this iron, which had been used only once for the purpose just mentioned, having been kept close corked for about two months, was accidentally broken; when some pieces of the iron were found covered with a green crust, and these had a strong smell of volatile alkali. On making some more experiments on this subject, he found that two months standing was requisite to produce the alkaline smell desired.

Sect. VIII. *Of Nitrous Air*.

150 How produced.

This kind of air is plentifully obtained in all cases where the nitrous acid is combined with phlogiston: Thus, when it is mixed with metals, or animal or vegetable substances, nitrous air is produced in great quantities; but very sparingly when treated with metallic calces, earths, or other matters which are said to contain little or no phlogiston. All the metals, excepting gold, platina, and regulus of antimony, which are not soluble in the pure nitrous acid, yield nitrous air on being treated with it; and even from these, when dissolved in aqua regia, some quantity of this air may be obtained. Every metal, however, does not yield it in equal quantity, with equal facility, or equally good. Silver, copper, iron, brass, bismuth or nickel, when put into nitrous acid, yield this air in considerable quantity: Mercury yields it but slowly without the application of heat, though no great degree of it is necessary. Copper and iron, especially the latter, require the acid to be cautiously applied on account of the violent emission of fumes. Gold, platina, and regulus of antimony, when put in aqua regia, yield nitrous air pretty readily; but lead yields it in smaller proportion than any other metal, and zinc does the same among the semimetals, the elastic fluid produced from it being mostly phlogisticated air.

151 Why strong nitrous acid yields its nitrous air.

In the production of this kind of air, great differences are perceived by a diversity in the strength of the acid. Thus, if we dissolve copper in strong nitrous acid, no nitrous air is produced, though the same materials will yield air in great quantity by the mere affusion of water to dilute the acid. This is very properly explained by Doctor Priestley, from the property that the nitrous acid has of attracting phlogiston, which is evident from what happens in the solution of mercury. When strong spirit of nitre is poured upon this metal, the solution soon begins, and is very rapid, yet not a single bubble of elastic fluid is produced; but in a short time the acid next to the mercury is changed of an orange colour, which is an indication of its having acquired phlogiston, probably from the nitrous air

Nitrous Air.

air which is decomposed the moment it is formed, and before its particles are united into visible bubbles. The bubbles of air indeed break through the coloured acid, but they disappear the moment they come in contact with the pale-coloured acid. As soon as the whole quantity of acid has assumed the orange colour, nitrous air escapes from it in considerable quantity; but the mixture of water deprives the acid of its power of decomposing nitrous air. The strong and pale-coloured nitrous acid ought to be diluted with at least two or three parts of water to one of the acid, for the easy production of nitrous air from copper and mercury.

In common experiments, no other degree of heat is necessary than that produced by the effervescence itself, except mercury be used, which requires the application of some degree of heat; but when the metal exposes a very great surface to the acid, as is the case when the filings of the metal are used, the effervescence and production of nitrous air are often much quicker than can be conveniently managed. The most proper method of producing nitrous air, however, is explained in the last section of this treatise.

152 Properties of nitrous air.

Nitrous air by itself is equally transparent and invisible with common air, excepting at its first production, when it is somewhat coloured, owing to a little superfluous nitrous acid, or to some earthy particles which are carried up with it. Its smell resembles that of nitrous acid, or indeed is the very same; because, in passing through the common air to our nostrils, it is decomposed, and converted into nitrous acid. The same is to be said of its taste; though Mr Fontana, who tasted it without any contact of external air, affirms that it has no taste whatever. The method in which he ascertained this fact was as follows. Having first introduced the nitrous air into a bottle of elastic gum in water, as is done with glass bottles, he brought his mouth, shut, while the neck of the elastic-gum bottle was under water, near the neck of it; and then, by pressing the bottle, introduced the nitrous air into his mouth. The experiment, however, is by no means void of danger; for if the person happens to draw any quantity of this air into the lungs, he may be nearly suffocated, as nitrous air is exceedingly noxious. In performing of it, he recommends to exhaust the mouth entirely of common air, though he does not inform us how this can be done; nor indeed is it easy to conceive the possibility of doing so.

Though nitrous air extinguishes flame, it may by certain processes be brought in to such a state that a candle will burn in it with an enlarged flame; and it becomes what Dr Priestley calls *dephlogisticated nitrous air*, which is treated of in the next section. It is remarkable, however, that when a candle is extinguished, as it never fails to be in common nitrous air, the flame seems to be a little enlarged about its edges by the addition of another bluish flame before the former goes out.

153 Extremely fatal to animal and vegetable life.

Nitrous air seems to be the most fatal to animal life of any. Even insects, which can bear phlogisticated and inflammable air, generally die the moment they are put into it. Frogs, snails, and other animals which do not respire very frequently, die in a few minutes, and generally do not recover even when taken out of this noxious fluid before they are dead. Plants perish very soon in nitrous air, and even in common air saturated with nitrous air; but Dr Priestley informs us, that "though in general plants die almost immediately in water impregnated with nitrous air, yet in one case of this kind, when the superfluous nitrous air was let out under water, so that no part of it was decomposed in contact with the water, the plant grew in it remarkably well."

Water, by agitation in nitrous air, may be made to imbibe one tenth part of its bulk; and afterwards the nitrous air may be expelled again by boiling, though not in the same quantity as it was absorbed; but for this purpose the water should be previously deprived of its air. Dr Priestley informs us, that having carefully pumped all the air out of a quantity of rain-water, letting it stand 24 hours in a good vacuum, and then impregnating it with nitrous air, he instantly expelled it again by boiling, when he obtained only about one fourth part of it, though sufficiently pure, and without any mixture of fixed air. Water may also be deprived of the nitrous air it contains, though it does not freeze quite so readily when impregnated with this air as in its natural state.

Nitrous air is absorbed by strong oil of vitriol nearly in the same quantity as by water; the acid acquiring a purple colour, by reason of the phlogiston contained in the nitrous air. The strong nitrous acid absorbs it in great quantity; and becomes smoking, orange coloured, and afterwards green, on account of the phlogiston contained in it. Marine acid imbibes but a small quantity, and very slowly, acquiring at the same time a light-blue colour. Both nitrous air and common air phlogisticated by it are meliorated by agitation in nitrous acid.

Nitrous air is absorbed in considerable quantity by radical vinegar, and the concentrated vegetable acid.—Solution of green vitriol imbibes it in much greater quantity than water, and acquires a black colour; which, however, soon goes off by exposure to the common air. Its taste also becomes acid.—Very little is absorbed by caustic alkalis. Oil-olive slowly absorbs a considerable quantity, but oil of turpentine absorbs much more. By a little agitation, it will imbibe more than ten times its quantity of nitrous air; acquiring at the same time a yellowish or orange colour, and becoming a little glutinous. The part which is not absorbed appears to be converted into phlogisticated air.—Ether and spirit of wine absorb it very quickly, but no nitrous air is obtained by the application of heat after they have absorbed it. It is greatly diminished by oil of turpentine, liver of sulphur, and pyrophorus; all of which leave it in a phlogisticated state. It is also diminished and phlogisticated by being kept in a bladder, alternately exposed to moisture and dryness. Nitrous acid air has the same effect.

154 Diminishes dephlogisticated air.

One of the most remarkable properties of nitrous air, is its diminution with dephlogisticated air; by which means it becomes a test of the quantity of that kind of air contained in the atmosphere. With pure dephlogisticated air, the diminution is almost to nothing, at the same time that some quantity of nitrous acid is reproduced by the decomposition of the nitrous air; but as our atmosphere is always mixed with a considerable quantity of phlogisticated air, on which nitrous

Nitrous Air. nitrous air has no effect, the diminution in this case is never so considerable. Upon this principle the EUDIOMETER is constructed.

155 Its antiseptic power. Another very remarkable property of nitrous air is its strong antiseptic power; insomuch that animal matters may, by its means, be preserved for many months without corruption. This property, it was thought, might have been extremely useful on many occasions; but Dr Priestley, after a number of experiments on the subject, concludes in the following manner. "Nitrous air will indeed preserve meat from putrefaction; but after long keeping, it becomes very offensive both to the nostrils and palate, though the smell is not altogether that of putrefaction; and indeed the substance continuing quite firm, it could not be properly putrid.—Having formerly experienced the remarkable antiseptic power of nitrous air, I proposed an attempt to preserve anatomical preparations, &c. by means of it; but Mr Key, who made the trial, found, that, after some months, various animal substances were shrivelled, and did not preserve their forms in this kind of air."

156 Specific gravity of nitrous air. The specific gravity of nitrous air, as well as of other kinds, has been ascertained by Mr Kirwan. As it corrodes metals, he endeavoured to find its weight by comparing the loss sustained by the materials which produce it. Thus he found, that 14 grains of the materials produced 38.74 inches of nitrous air; and, consequently, by proper calculation, that the specific gravity of nitrous air is to that of atmospheric air as 1195 to 1000.—"If this air (says he) had been obtained over water, or in strong heat, its weight would probably have been very different; as it is liable to be mixed with phlogisticated air, nitrous vapour, and a variable quantity of water. Nitrous vapour would render it heavier, and phlogisticated air or water probably lighter."

157 Component parts of nitrous air. With regard to the constituent principles, or elements of nitrous air, all those who look upon phlogiston to be a distinct substance, have believed that the former is a compound of nitrous acid and phlogiston. By the opposite party, it is supposed to be a substance entirely simple, and one of the constituent parts of the nitrous acid. This opinion seems in part now to be entertained by Dr Priestley himself, notwithstanding his former sentiments on the subject. "I had no doubt on the subject (says he) until I read the work of Mr Metherie; who asserts, that nitrous air contains no proper nitrous acid, but only one of the elements of it; the other being dephlogisticated air, which had before been considered by Mr Lavoisier as the principle of all acidity.—Among other observations in support of his assertion, Mr Metherie has the following. 1. Nitrous air burnt together with inflammable air, produces no nitrous acid. 2. Though nitrous air be obtained from a solution of mercury in the nitrous acid, almost all the acid is found in the solution. 3. Nitrous air, absorbed by marine acid, does not make aqua regia. 4. He is of opinion, that a small portion of the nitrous acid being decompofed, furnishes a pure air, so altered, that, uniting with inflammable air, it changes it into nitrous air.

"In reviewing the experiments I had formerly made on this kind of air, I could not recollect any of them in which the pure nitrous acid was produced, excepting that with dephlogisticated air, besides the experiment in which it was decomposed by the electric spark; which furnishes a strong objection to this hypothesis." To ascertain the matter more fully, the following experiments were made. Nitrous Air.

"When nitrous air is decomposed by iron, or by a mixture of iron and sulphur, the water, over which the process is conducted, acquires no acidity; but I had supposed that all the acid was absorbed by the iron. Having by me a quantity of this iron which had been reduced to perfect rust in nitrous air, and which, I knew, must have imbibed more than its weight of this air, I thought that the acid might be obtained from it by distillation; but a quantity of this rust of iron, distilled in an earthen retort, yielded neither nitrous air nor nitrous acid, at least in any quantity that could favour the common hypothesis.

"I then endeavoured to decompose nitrous air by heating iron in it with a burning lens; and in this process I succeeded far beyond my expectation: for the air was presently diminished in quantity, while the iron became of a darker colour, was sometimes melted into balls, and gathered considerable weight, though it had no appearance of containing any nitrous acid.—In the first experiment, the original quantity of nitrous air was diminished to about one-third; and after this, it was increased." The increase was found to arise from a production of inflammable and dephlogisticated nitrous air.

The Doctor proceeded to try various other experiments on the decomposition of nitrous air, particularly that of burning Homberg's pyrophorus; but without any success, or obtaining the smallest particle of nitrous acid. His conclusions from the whole are the following.

"Water seems to be a necessary ingredient in nitrous as well as inflammable air; at least, without a quantity of water, nitrous air cannot be formed. For example, copper will be dissolved in strong nitrous acid without producing any nitrous air, just as iron may be dissolved in concentrated vitriolic acid without producing inflammable air. 158 Nitrous air composed of phlogisticated nitrous acid and water.

"That nothing is necessary to the formation of nitrous air besides phlogisticated nitrous acid and water, is evident from the production of it by the impregnation of pure water with phlogisticated nitrous vapour formed by the rapid solution of bismuth; an experiment which I mentioned before. However, to make it in a more unexceptionable manner, I interposed a glass vessel between that in which the solution was made and that in which the water to be impregnated with the phlogisticated vapour was contained, that whatever was distilled over by the heat of the process might be prevented from reaching the water. In these circumstances, however, when nothing but the dry phlogisticated vapour could enter the water, it began to sparkle and yield nitrous air very copiously as soon as it had received a bluer tinge from the impregnation.—Nitrous air is also produced by pouring a highly coloured or phlogisticated nitrous acid into pure water, in which no metal or earthy matter is any way concerned.

"I have formerly observed, how readily nitrous air is diminished by taking the electric spark in it. This experiment I have frequently repeated, in order more particularly 159 Effects of the electric spark on nitrous air.

Nitrous Air. particularly to ascertain the quantity and quality of the residuum. In one experiment half an ounce of nitrous air was reduced, an less than half an hour, to one quarter of its bulk. One-fourth of the residuum was still nitrous, and the rest phlogisticated. Taking the electric spark in a quantity of nitrous air till it was diminished to one-third, the whole was completely phlogisticated, not affecting common air at all, and extinguishing a candle. A white matter was formed with the mercury over which the spark was taken, which made the water admitted to it extremely turbid. In another process, the electric spark was taken in a quantity of nitrous air till it could be no more diminished, when it was reduced in bulk in the proportion of $10\frac{1}{2}$ to 24. Letting it stand all night upon the mercury, it was increased in the proportion of $11\frac{1}{4}$ to 24; seemingly by the acid uniting to the mercury and generating more nitrous air, since it had that smell. No water appeared after the process; and the water admitted to it acquired no acid taste, but an astringent one like that of water impregnated with nitrous air. There was a white powder formed, as in the former experiments.—To try if it were possible to make water imbibe the acid from the nitrous air, the electric spark was taken in it, with a small quantity of water over the mercury. But even this water did not acquire any acid taste, but only an astringent one."

The Doctor concludes his experiments on this subject with a conjecture, that the phlogiston, and neither the heat nor light of the electric, contributes to the decomposition of the nitrous air. As his final sentiments on the matter, however, are merely conjecture, without any certain experiments to confirm them, we shall here refer the reader to his Section on Theory, at the end of his sixth volume of Experiments, &c.

SECT. IX. *Of Dephlogisticated Nitrous Air.*

160
How procured.
THIS species differs from common nitrous air in being able to support flame, though it still continues fatal to animal life. Common nitrous air may be converted into the dephlogisticated kind by particular processes; though, when zinc is dissolved in the nitrous acid, if the air be taken at different times, that which comes about the middle, or rather the latter end of the process, will be of this kind; in which it not only supports the burning of a candle, but the flame is enlarged (sometimes to four or five times its original bulk) by the addition of a weaker and bluish flame round the former; and this burning is sometimes accompanied with a crackling noise, as if the candle was burning in dephlogisticated air. It may also be obtained in some part of the process of procuring nitrous air from iron, though with this metal the success is uncertain; but tin yields a considerable quantity of it. By exposing iron to nitrous air, it may be so far dephlogisticated as to admit a candle to burn in it. Dr Priestley filled an eight-ounce phial with nails, and then with mercury; and displacing the mercury with nitrous air, left the phial inverted in a quantity of the same fluid. Two months after, the nitrous air was found to be changed in such a manner as to admit a candle to burn in it with its natural flame; and by continuing still longer in contact with the iron, a candle would burn in it with an enlarged flame. These changes, however, are very irregular, so that they seldom produce the like effects with the regularity one might expect. Dr Priestley once found, that by the contact of iron in quicksilver, it was so changed as to be fired with an explosion like a weak inflammable air; whilst another quantity of nitrous air, which had been treated in like manner for about the same length of time, only admitted a candle to burn in it with an enlarged flame. 161

Dephlogisticated Nitrous Air.

Component parts of dephlogisticated nitrous air.
In that section of his last volume in which the Doctor treats of this kind of air, he observes, that water is absolutely necessary to its composition, or rather to the decomposition of the common nitrous air by iron. He had decomposed it before, either by previously filling the vessels that were to contain the nitrous air with water or with mercury; though it had always required a much longer time when the latter was made use of. The reason of its being formed at all in this last way, was a small quantity of moisture adhering to the inside of the vessel containing the mercury. 162

Effects of water on nitrous air.
To try the influence of water in this case, he now procured a number of very clean small needles; and having made a phial, and likewise a proper quantity of mercury, quite clean and dry, he put the needles into the phial, and, filling it up with mercury, introduced the nitrous air: but it continued in this way for six or eight months without the smallest alteration. Introducing a few drops of water, a diminution of about one-third of the air took place, and the remainder appeared to be phlogisticated. On the 26th of May 1782, he examined a quantity of nitrous air, which had been confined with iron-shavings from the 27th of August preceding, when he found one-half of it absorbed; the remainder supported the flame of a candle better than common air, though a mouse died in it; and yet this air had continued several months in the same state with regard to quantity, nor was it at all probable that its quality would have been altered by any length of time. 163

Best method of procuring it.
Though this kind of air is produced by the contact of iron and nitrous air, the Doctor has never been able to ascertain the quantity of nitrous air which a given quantity of iron can decompose; and though iron soon becomes so much affected by this process that it crumbles into powder, it still seems equally capable of decomposing a fresh quantity. Having made a comparative experiment, by putting together one quantity of nitrous air with fresh iron and another with rust, he found that in both the air was diminished to about one-third, and a candle burned in both equally well; but neither of them had the properties of fresh nitrous air in any degree.

As the process for obtaining dephlogisticated nitrous air by means of iron is very tedious, the Doctor endeavoured to find another which might be attended with less inconvenience. This he accomplished by dissolving turnings of iron in a dilute solution of copper in nitrous acid (the same that remains after the production of nitrous air), mixing it again with an equal quantity of water. Without this precaution, he tells us, that though the iron will at first be acted upon very slowly, yet the mixture will at length grow so hot as actually to boil, and the process will be exceedingly troublesome; however it will be necessary, previous to any attempt to dissolve the iron, to heat the solution of copper, in order to expel all the nitrous air and super-

fluous

Dephlogisticated Nitrous Air. fluous nitrous acid. Without this precaution a quantity of common nitrous air will be produced.

Dephlogisticated nitrous air is absorbed by water almost as readily as fixed air, and in considerable quantity; the liquid taking up about one-half its bulk of air. After being thus saturated, the whole quantity of dephlogisticated nitrous air may be expelled pure by heat, and is easily received in vessels containing mercury. It was likewise observed, that as this kind of air much resembles fixed air in its properties of being imbibed by water, and expelled again by heat, it resembles it also in this farther property, that all the air which has been actually incorporated with the water will not be imbibed by water again. But the proportion of this part is three or four times greater than the corresponding part of fixed air; it is also considerably more phlogisticated. Water impregnated with it very soon parts with it again on being exposed to the atmosphere.—It discovers not the smallest trace of containing either acid or alkali. Its specific gravity is less than that of common air. On heating red precipitate in this kind of air, pure dephlogisticated air was produced without affecting, or being affected by, the nitrous air. Repeating the experiment with malleable iron, the quantity of it was enlarged, and the whole

164 Made to approach to the nature of atmospherical air. phlogisticated, without any mixture of fixed air. By heating bits of clean crucibles or retorts in this kind of air, it seemed to approach in quality to common atmospherical air; and the effects were always found to be the more considerable the longer the process was continued. On attempting, however, to determine whether this change in the constitution of dephlogisticated nitrous air was occasioned by means of heat or light, he heated it in earthen tubes; but found, that though these were glazed both on the outside and inside, and seemed perfectly air-tight both before and after the experiment, the air had escaped. By the electric spark it was rendered wholly immiscible with water, and brought to the standard of 1.45; so that the Doctor had no doubt of its being respirable. Yet this kind of air, though it admits a candle to burn so well in it, will not kindle pyrophorus, though the nitrous air from which it is produced would instantly set it on fire.

Sect. X. *Of Vitriolic, Nitrous, Marine, and other Acid Airs.*

165 How procured. § 1. *Vitriolic acid Air.*—This is always a combination of vitriolic acid with phlogiston, and consequently may be procured from any mixture of that acid in its highly concentrated state with phlogistic matters. Hence it is obtained from all the metals, gold and platina excepted, on boiling them with strong oil of vitriol. It is also procurable from the same acid rendered black by any phlogistic matter. No greater heat is required to expel this kind of air than that produced by the flame of a candle. It is the heaviest of all aërial fluids, next to fluor acid air, being to common air as 2265 to 1000. Dr Priestley informs us, that a quantity of vitriolic acid thus impregnated with phlogiston, will yield many times more air than an equal quantity of the strongest spirit of salt.—When the vitriolic acid air is produced in great plenty, the top of the phial in which it is generated is commonly filled with white vapours. The air has also the same appearance as it is transmitted through the glass tube; and it is sometimes discoverable in the recipient. When such substances are put to the oil of vitriol as cause a great effervescence with that acid, care should be taken to add them by very small quantities at a time, and likewise to apply the heat by very slow degrees, lest the rapid production of air, and the heat attending it, should break the vessels. It is most equably produced by using strong oil of vitriol and charcoal; but in most cases the production of vitriolic acid air is attended with that of inflammable, and sometimes fixed or phlogisticated air. With ether about one-half of the first produce is inflammable; but the quantity lessens as the process goes on. The Doctor observed, that, when quicksilver was used, the acid was not turned black, as in other experiments of the like nature. He also observed, that iron yielded a little inflammable air together with the acid gas; but that the elastic fluid produced when zinc was used, contained about two parts of inflammable and one of acid air. Copper, silver, and lead, when heated in vitriolic acid, yield the purest vitriolic acid air, without any mixture of inflammable air; but the lead yields only a very small quantity, and requires a great degree of heat. It is procured in the greatest abundance from the fumes of burning sulphur, and is then called the *volatile vitriolic*, or *sulphureous acid;* for an account of the properties of which, see Chemistry, (*Index*).

Nitrous Acid Air.

§ 2. *Of Nitrous Acid Air.*—This is the pure nitrous acid by itself, without any addition of phlogiston. It is procured by heating the strong spirit of nitre in a phial, and then receiving the vapour in glass vessels filled with quicksilver. It is, however, extremely difficult, or rather impossible, to preserve it for a length of time by means of any fluid hitherto known. Water absorbs it immediately, and quicksilver is corroded, and produces nitrous air. "But (says Dr Priestley) tho' the acid vapour very soon unites with the quicksilver, yet, the jar in which it was received being narrow, the saline crust which was formed on the surface of the quicksilver, impeded the action of the acid upon it till I had an opportunity of admitting water to the air I had produced, and of satisfying myself, by its absorption, of its being a real acid air, having an affinity with water similar to other acid airs." 166 How obtained. 167 Cannot be preserved by means of fluids.

The most remarkable property of this vapour is, that its colour may be made more or less intense by the mere circumstance of heat. It may be confined in glass vessels with ground-stoppers, or in tubes hermetically sealed, and thus exposed to the action of heat: in which case it will be found, that the colour of the vapour becomes considerably more intense in proportion as the glass vessel containing it is more or less heated; and that, on the contrary, the intensity of the colour diminishes as it is cooled. "It seems probable (says Dr Priestley), that if this vapour was not confined, but had room to expand itself, it would become colourless with heat. This at least is the case when it is combined with water. The phenomena I refer to are very common in the process for making dephlogisticated air, in which I first observed them. But the same things are observable in the process for producing any other kind of air in which much spirit of nitre is made use of; and likewise constantly in the common process for making spirit of nitre itself. It is, that when the heat is moderate, the vapour within the 168 Assumes a red colour by being heated.

Marine Acid Air.

169 Its effects on red-lead.

the glass tube or retort is red; but that, as the heat increases, it becomes transparent." The Doctor having observed that red lead, impregnated with nitrous vapour, may be preserved a long time without deliquescing or losing its acid, made use of a composition of this kind for procuring the nitrous vapour with which he filled his tubes. By imbibing this vapour the minium lost its red colour and became white. "I put (says he) a small quantity of this white minium into a glass tube closed at one end; then holding it to the fire, make it emit the red vapour till the whole tube is filled with it; and having the other end of the tube drawn out ready for closing, as soon as the vapour begins to issue out of that end, I apply my blowpipe and seal it. By this means I conclude that the tube is filled with a pure red vapour, without any mixture of nitrous air, and perhaps common air also." For a further account of the properties of nitrous acid air, see CHEMISTRY, (*Index.*)

§ 3. *Of Marine Acid Air.*—The marine acid, by heat, may be resolved into a permanently elastic and transparent invisible vapour, which, however, is more

170 How obtained.

easily preserved in its aërial state than nitrous acid air, as the former has no effect upon quicksilver. An easy and cheap method of obtaining this kind of air is by filling a phial, fitted with a glass tube and stopper, with common salt, and then pouring a small quantity of oil of vitriol upon it; which, by the assistance of heat, will disengage the acid principle, or the marine acid air, from the salt. "A phial (says Dr Priestley) prepared in this manner will suffice, for common experiments, many weeks; especially if some more oil of vitriol be occasionally put to it. It only requires a little more heat at the last than at the first. Indeed, at first, the heat of a person's hand will often be sufficient to make it throw out the vapour. In warm weather it will even keep smoking many days without the application of any other heat. On this account it should be placed where there are no metallic utensils which it can corrode; and it may easily be perceived when the phial is throwing out this acid vapour, as it always appears in the open air in form of a light white cloud."

171 Its properties.

After the marine acid has yielded all the air that can be expelled from it, it is extremely weak, so that it can but barely corrode iron. The gas itself is considerably heavier than common air, the specific gravity of the two being in the proportion of five to three; a cubic inch weighing 0.654 grains. It is very fatal to animal life, but less so than pure nitrous air; for flies and spiders live longer in marine acid than in nitrous air. In dipping a candle into a jar of this air the flame is extinguished; but the moment before it goes out, and also when it is afterwards first lighted again, it burns with a green or light-blue flame, like that of common salt thrown into a fire. Its diminution by the electric spark is barely perceptible. Ice is dissolved by it as fast as if it touched a red-hot iron. It is partly absorbed by almost every substance containing phlogiston, and the remaining part becomes inflammable. Oil of olives absorbs it very slowly, and oil of turpentine very fast; by which they both become almost black, and the remainder of the air is inflammable. Essential oil of mint absorbs marine air pretty fast, becoming brown, consistent, and so heavy

Fluor Acid Air, &c.

as to sink in water; and its smell is in great measure altered. Ether absorbs it very fast, and has its colour altered by the impregnation, becoming first turbid, then yellow, and at last brown. The air over the ether

172 Changed into inflammable air.

is strongly inflammable. A small bit of phosphorus smoked and gave light in this acid air; and the elastic fluid was but little diminished in twelve hours. On the admission of water, about four-fifths of the gas were absorbed, and the rest was inflammable. This change was also effected by a great number of other substances: some of which, however, required a considerable time to produce their effect; such as crusts of bread not burned, dry wood, dry flesh, roasted pieces of beef, ivory, and even flints. See CHEMISTRY, (*Index.*)

§ 4. *Of Fluor Acid Air.*—The discovery of fluor acid air was made by Mr Scheele, who obtained it by distilling the spar called fluor with vitriolic acid. Dr Priestley, who made several experiments upon the sub-

173 Different from vitriolic acid air.

ject, was of opinion that this new acid was only the vitriolic disguised by its connection with the fluor. He even supposed that he had produced it by pouring vitriolic acid on other phosphoric spars: both these opinions, however, he has now retracted, and believes the fluor acid to be one of a peculiar kind. Its most remarkable property is the great attraction it has for siliceous earth, so that it even corrodes and makes holes in the retorts in which it is distilled. See CHEMISTRY, (*Index.*)

§ 5. *Of the Vegetable and another Acid Air.*—By means of heat alone, the concentrated vegetable acid emits a permanently elastic and aërial fluid. This has the properties of the acid of vinegar; but, like it, is weaker than the rest of the mineral acid airs, though it agrees with them in its general characters. Water imbibes it as readily as any of the other acid airs; oil-olive readily absorbs it, and in considerable quantity,

174 Phlogisticates common air.

losing at the same time its yellowish colour, and becoming quite transparent. Common air is phlogisticated by it, as it is also by the liquid vegetable acid. As the vegetable acid, however, from which this air had been obtained, was distilled by oil of vitriol, the Doctor suspected that what he had examined might derive most of its properties from the oil of vitriol, and rather be vitriolic than vegetable acid air.

175 Air from solution of gold.

An acid air, somewhat different from any hitherto described, was obtained by Dr Priestley from the vapour arising on distilling to dryness a solution of gold in marine acid impregnated with nitrous acid vapour, which makes the best kind of aqua regia. "The produce (says he) was an acid air of a very peculiar kind, partaking both of the nature of the nitrous and marine acids; but more of the latter than of the former, as it extinguished a candle; but it was both extinguished and lighted again with a most beautiful deep blue flame. A candle dipped into the same jar with this kind of air went out more than 20 times successively, making a very pleasing experiment. The quantity of this acid air is very great; and the residuum I have sometimes found to be dephlogisticated, sometimes phlogisticated, and at other times nitrous air."

SECT. XI. *Of Hepatic Air.*

THIS species of air, first particularly taken notice of by Mr Bergman, who obtained it from an ore of zinc

Atmospherical Air

176 Produced first from an ore of zinc.

177 Best obtained from hepar sulphuris.

zinc called *Pseudogalena nigra Dannemorensis*, and which was found to contain 29 parts of sulphur, one of regulus of arsenic, six of water, six of lead, nine of iron, 45 of zinc, and four of siliceous earth. The hepatic air was produced but in small quantity by pouring oil of vitriol on this mineral; spirit of salt produced it in much larger quantity; but nitrous acid produced only nitrous air. The most proper method of obtaining this air is by pouring marine acid on hepar sulphuris, which extricates it in vast quantity. It is said also to be sometimes produced naturally from putrefying matters. It is the characteristic of all livers of sulphur, whether they be made with alkalis or earths. The smell of the pure gas is intolerable; and the vapour has a disagreeable effect on many metallic substances, particularly silver, lead, copper, &c. destroying their colour, and rendering them quite black. It is suddenly fatal to animal life, renders syrup of violets green, and is inflammable, burning with a very light blue flame. It is decomposed by vitriolic and nitrous air, by dephlogisticated air, and by the contact of atmospherical air, in which case it deposites a small quantity of sulphur; being indeed, as is supposed by Mr Bergman and Mr Kirwan, no other than sulphur kept in an aërial form. Its specific gravity, compared with that of atmospherical air, is as 1106 to 1000. It combines readily with water, and gives the smell to the sulphureous medicinal waters. Its great attraction for some of the metals and their calces makes it the basis of some *Sympathetic Inks*. See also Chemistry, (*Index.*)

Sect. XII. *Of Atmospherical Air.*

178 Proportion of the two ingredients of which it is composed.

The two component parts of our atmosphere, viz. dephlogisticated and phlogisticated air, have been so fully treated of under their respective sections, that little remains to be said in this place, excepting to determine the proportion in which they are usually met with in the common air. The only regular set of experiments which have been made on this subject are those of Mr Scheele. He constructed an eudiometer, consisting of a glass receiver, which could contain 34 ounces of water, and a glass cup containing a mixture of one pound of iron-filings, and an equal weight of flowers of sulphur moistened; which cup standing upon a glass supporter, was inserted in the former receiver, which, when this was in it, could contain 33 ounces of water. To the outside of the glass tube or receiver, was affixed a slip of paper, to the height of a third of the tube, containing 11 divisions, each corresponding to one ounce of water. This paper was varnished over with oil varnish, to prevent its being spoiled by water. The whole then was placed in water, which gradually rose as the air was diminished. This mixture would serve four times before the power of diminishing air was lost. He carefully compared the height of the air therein with the barometer and thermometer, both before and after the experiment; in eight hours the experiment was completed. With this instrument he examined the goodness of the common air in Stockholm every day for a whole year, and found the diminution never to exceed $\frac{10}{30}$, nor to fall short of $\frac{8}{33}$; so that upon a medium it may be estimated at $\frac{9}{33}$. During the months of January and February it

was $\frac{9}{33}$. The 23d of March it was $\frac{8}{33}$, though the cold increased, and the barometer stood higher than before. The 19th of April it was $\frac{10}{33}$, though the barometer and thermometer did not vary, and so stood till the 21st. In May and June it stood between $\frac{8}{33}$ and $\frac{9}{33}$. The 30th of July it stood at $\frac{10}{33}$. From the 3d to the 15th of September at $\frac{9}{33}$. The 6th of October at $\frac{10}{33}$, during a high storm; but after it stood between $\frac{8}{33}$ and $\frac{9}{33}$, till the 4th of November, when it fell to $\frac{8}{33}$, and continued between $\frac{8}{33}$ and $\frac{9}{33}$ to the 20th, when it rose to $\frac{10}{33}$. The 21st it fell to 8, and stood between $\frac{8}{33}$ and $\frac{9}{33}$ till the 8th of December, when it rose to $\frac{9}{33}$; and from thence to the 31st it stood between $\frac{8}{33}$ and $\frac{9}{33}$.

Atmospherical Air.

As it has already been shown that the pure dephlogisticated part of the atmosphere is entirely consumed by phlogistic processes, such as that of fermenting brimstone and iron-filings, this eudiometer must be considered as an exact test of the proportion of dephlogisticated air contained in the atmosphere. The small variation in the quantity shows, that the processes in nature which destroy this air, are nearly balanced by those which produce it; though it must appear surprising, that both these fluids, so extremely different, should be produced at all seasons of the year in a proportion nearly equal; nor is it less surprising that two fluids of unequal specific gravity should remain incorporated together without any tendency to separate, which it is certain they never do, either in the atmosphere itself, or when confined in vessels in any quantity whatever.—As phlogisticated air is somewhat lighter than dephlogisticated, it might be supposed that the former would occupy the higher regions of the atmosphere in such a manner as to render them considerably more unwholesome than the lower parts; but this seems not to be the case: On the contrary, it appears by experiments with the eudiometer, that the upper parts of the air contain a greater proportion of dephlogisticated air than those near the earth. See Eudiometer.

179 Upper regions of the air more salubrious than the lower.

Sect. XIII. *Of the artificial Production of Airs of different Kinds.*

§ 1. *Fixed Air*, or *Aërial Acid*. The artificial methods of producing this are principally three, viz. by fermentation, by heat, and by acids.

(1.) *By fermentation.* When vegetable or animal substances, especially the former, are fermented, they yield a great quantity of fixed air. In breweries, on the surface of the fermenting liquor, there is always a stratum of fixed air reaching as high as the edge of the vats; so that if these vessels are deep, and the fermenting liquor much below their edges, the above-mentioned stratum may be some feet in thickness. The same phenomenon is observable in the fermentation of wines in general; and it is owing to the production and elasticity of fixed air, that fermenting liquors, when put into close vessels, often burst them with great violence. The case is the same whatever substance it is that undergoes the vinous fermentation, though the quantity of fixed air produced is not the same in all substances, nor even in the same substance at different times. From 42 cubic inches of beer Dr Hales obtained 639 cubic inches of air in 13 days. From a quantity of sugar

Of Artificial Airs.

undergoing the vinous fermentation, Mr Cavendifh obtained fo much fixed air, that out of 100 parts of the former 57 appeared to have been volatilized and converted into fixed air.

But though a vaft quantity of fixed air efcapes during this procefs of fermentation, a very confiderable portion ftill remains united with the fermented liquor, and to this it owes all its brifknefs and agreeable pungent acidulous tafte; for when the fixed air is totally evaporated, the liquor becomes entirely vapid and flat. Hence alfo we are furnifhed with a method of reftoring the brifknefs to thefe liquors after they have loft it in confequence of being expofed to the atmofphere, viz. by impregnating them again with fixed air, either naturally or artificially produced.

Dr Prieftley has made feveral experiments in order to determine the quantity of fixed air contained in feveral forts of wine. His method was to take a glafs phial (fitted with a ground ftopple and tube), capable of containing $1\frac{1}{2}$ ounce-meafure. This he filled with wine, plunging it into a proper veffel of water. The whole was then put over the fire, and the water, into which the phial was plunged, fuffered to boil. The end of the tube being placed under the mouth of an inverted receiver filled with quickfilver, the heat expelled the fixed air from the wine, which entering into the receiver, afcended in bubbles through the quickfilver to the top, pufhing out part of the metal and taking its place. The refult of his experiments was as follows:

$1\frac{1}{2}$ oz. meafure of	Madeira	contained of pure fixed air	$\frac{1}{100}$	of an ounce meafure.
	Port of fix years old		$\frac{1}{48}$	
	Hock of five years		$\frac{1}{24}$	
	Barrelled claret		$\frac{1}{12}$	
	Tokay of 16 years		$\frac{1}{20}$	
	Champagne of two years		2 oz. meafures.	
	Bottled cyder of 12 years		$3\frac{1}{4}$ ditto.	

During the acetous fermentation alfo, liquors emit a vapour, great part of which is fixed air, though the nature of its other component parts has not yet been thoroughly afcertained.

Fixed air is likewife produced, though in no great quantity, by putrefaction. In this cafe, however, a great part of the elaftic fluid confifts of inflammable and phlogifticated air, and the fixed air itfelf feems to be intimately connected with a putrid offenfive effluvium. It feemed to Dr Prieftley to "depend in fome meafure upon the time and other circumftances in the diffolution of animal or vegetable fubftances, whether they yield the proper putrid effluvium, or fixed or inflammable air."

The elaftic fluid produced by putrifying vegetables, when kept in a moderate degree of heat, is almoft all fixed air; while that from animal fubftances contains feveral times more inflammable than fixed air. Vegetable fubftances yield almoft all the permanently elaftic fluid in a few days, but animal bodies continue to emit it for feveral weeks. When the elaftic fluid yielded by animal fubftances is abforbed by water, and that water boiled, the fixed air may then be obtained without any mixture of the putrid effluvium. It is alfo to be obferved, that the quantity of elaftic fluid producible from animal fubftances is various according to the nature of the parts of the animal employed. Thus the mufcular parts will yield lefs elaftic fluid, and alfo lefs mixed with any putrid or offenfive effluvium, than a whole animal,* or than the liver, &c. The proportion of inflammable and of fixed air is alfo various, according to the various parts employed.

Of Artificial Airs.

(2.) *By heat.* In every combuftion, except that of fulphur or of metals, a quantity of fixed air is generated. This may be obferved by fixing a lighted candle in an inverted receiver over a bafon of lime-water, for a precipitation of the lime will prefently enfue; and the fame precipitation (which is one of the characteriftics of fixed air) will always enfue, whether a candle, a burning piece of wood, or, in fhort, any other combuftible fubftance, except fulphur or metals, be made ufe of.

During this production or extrication of fixed from atmofpherical air, the latter is commonly fuppofed to be confiderably diminifhed, though Mr Lavoifier and Mr Scheele have now rendered that opinion doubtful. If a piece of charcoal be burned by throwing the focus of a lens upon it when contained in a glafs-receiver inverted in water, after the apparatus is cooled, the water will have mounted a fmall way into the receiver. The diminution, however, is limited, and depends on feveral circumftances. Dr Hales has obferved, that, in equal receivers, the air fuffers a greater diminution by burning large candles than fmall ones; and likewife that, when equal candles are made ufe of, the diminution is greater in fmall than in large receivers. The caufe of this phenomenon probably is, that the air contained in the receiver cannot all come into contact with the flame of the candle; whence, as foon as the air which is neareft the flame becomes contaminated, the candle is extinguifhed. Thus the author of a Concife Treatife on the Various Kinds of Permanently Elaftic Fluids, has diminifhed the air of an inverted receiver one fixth part, by moving the candle whilft it burned through the different parts of the veffel, fo that the flame was brought into contact with a greater quantity of the confined air than if it had remained in one fituation till it became extinct. Dr Mayow obferved, that by the burning of a candle the air was diminifhed of one thirtieth only; Dr Hales found it to be diminifhed of one twenty fixth part; and Dr Prieftley found it to be diminifhed of one fifteenth or fixteenth. Mr Cavendifh obferved, that air fuffered a diminution of one-tenth of the whole quantity, by paffing through an iron-tube filled with red-hot powder of charcoal. A candle, or any other combuftible body, will ceafe to burn by itfelf, and confequently to contaminate a quantity of confined air much fooner than when it is, in fome manner, forced to burn by the external application of heat. "The focus of a burning mirror," fays Dr Prieftley, "thrown for a fufficient time either upon brimftone or wood, after it has ceafed to burn of its own accord, and has become charcoal, will have a much greater effect of the fame kind, diminifhing the air to its utmoft extent, and making it thoroughly noxious." The combuftion of the phofphorus of urine diminifhes air in a great degree. Mr Lavoifier has obferved, that by the combuftion of phofphorus, air may be diminifhed of about one-fifth or one-fixth. This accurate philofopher has alfo obferved, that the acid of phofphorus thus formed, acquires the weight loft by the diminifhed air; finding that about three inches of air were abforbed by every one

one grain of phoſphorus, when the experiment was tried with a receiver inverted in water, upon the ſurface of which a ſmall quantity of oil had been introduced; but when the receiver was inverted in quickſilver, the abſorption was conſtantly between two one-fourth and two three-fourth inches for each grain. Mr Cavallo mentions his having often repeated the experiment of burning phoſphorus in a glaſs tube inverted in water, by applying the cloſed part of the tube, wherein the phoſphorus was contained, to a pretty ſtrong fire, when he always obſerved that the utmoſt diminution of the incloſed air effected by this means was full one-fifth.

Dr Hales remarked, that after the extinction of candles in a receiver, the air continued to diminiſh for ſeveral days after. This may be owing to the gradual abſorption of part of it by the water; it having been remarked by Dr Prieſtley, "that this diminution of air by burning is not always immediately apparent, till the air has paſſed ſeveral times through water; and that when the experiment was made with veſſels ſtanding in quickſilver inſtead of water, the diminution was generally inconſiderable till the air had paſſed through water."

In theſe experiments of burning combuſtible bodies in a quantity of air, and meaſuring the diminution, we ſhould always remark two cauſes of miſtake, viz. the abſorption of air by the coaly reſiduum of the burned matter, which ſometimes is very conſiderable, or by the fluid in which the receiver is inverted, and the production of elaſtic fluid from the burning ſubſtances; thus gunpowder generates a great quantity of elaſtic fluid when inflamed, &c.

Even the electric ſpark ſeparates fixed air from common atmoſpherical air; for when a number of theſe ſparks are taken in a ſmall quantity of common air over lime-water, a diminution will take place, the lime will be precipitated, and if we put a blue vegetable juice inſtead of the lime-water, it will be turned red by the acidity of the fixed air depoſited upon it. Dr Prieſtley having cemented a wire into one end of a glaſs tube, the diameter of which was about one-tenth of an inch, and having fixed a braſs ball to that extremity of the wire which was out of the tube, filled the lower part of it with the juice of turnſole or archil, ſo that a quantity of common air was contained in the tube between the extremity of the wire and the ſurface of the liquor. Then taking electric ſparks between the ſaid wire and liquor for about one minute, the upper part of the liquor began to look red, and in about two minutes it was manifeſtly ſo. The air, at the ſame time, was diminiſhed in proportion as the liquor became red; but when the diminution arrived to be one-fifth of the quantity of the air contained, then a longer electrization produced no ſenſible effect. "To determine," ſays the Doctor, "whether the cauſe of the change of colour was in the air or in the electric matter, I expanded the air which had been diminiſhed in the tube by means of an air-pump, till it expelled all the liquor, and admitted freſh blue liquor in its place; but after that, electricity produced no ſenſible effect, either on the air or on the liquor; ſo that it was evident that the electric matter had decompoſed the air, and had made it depoſite ſomething that was of an acid nature."

The calcination of metals, as already obſerved, phlogiſticates, and conſequently diminiſhes common air; but does not produce any fixed air, ſince the lime-water, over which the calcination is made, does not become turbid; and when metallic calxes are expoſed to a ſufficient ſtrong heat, they in general yield ſome fixed air: ſo that it ſeems that the fixed air which is formed in the act of the calcination of metals is abſorbed by the calx. Some fixed air may be obtained from red lead, by no greater degree of heat than that of the flame of a candle applied to the phial that contains it.

180 Obtained from earths by means of heat.

The calcareous earths, which, when acted on by acids, yield a vaſt quantity of fixed air, produce a very ſmall quantity of it when expoſed to a ſtrong heat by themſelves, in a proper veſſel, even when expoſed to the focus of a lens. Dr Prieſtley, in his experiments relating to the production of dephloſticated air from various ſubſtances, when moiſtened with nitrous acid, and afterwards expoſed to a ſufficient degree of heat, generally found that ſome fixed air was produced together with the dephlogiſticated air; but often obtained fixed air only, without any dephlogiſticated air being mixed with it, or fixed and nitrous air together. From half an ounce of ruſt of iron, moiſtened with ſpirit of nitre, and dried, he obtained about a quart of elaſtic fluid, about one-third of which was fixed and the reſt nitrous air. From aſhes of pit-coal, treated in the ſame manner, he obtained nearly the like reſult. But in thoſe experiments, the Doctor moſtly uſed a gun-barrel, into which he introduced the ſubſtances to be tried; ſo that it is very probable, as he juſtly obſerves, that the iron might have contributed to the formation of the fixed air. In fact, when he tried ſubſtances of the ſame ſort, firſt in a gun-barrel and then in glaſs veſſels, he obtained much more fixed air in the former than in the latter caſe. One of thoſe experiments he made with tobacco pipe-clay, which, after being moiſtened with ſpirit of nitre, was when dry expoſed to the fire in a gun-barrel, and yielded ſome elaſtic fluid, which appeared to be wholly fixed air; but repeating the experiment in a glaſs-phial with a ground ſtopple, and taking the produced elaſtic fluid at eight different times, found that on the beginning ſome fixed air was produced, but afterwards the produce was dephlogiſticated air. He made a ſimilar experiment with flints carefully calcined in cloſe veſſels, and obtained a ſimilar reſult.

181 From different minerals.

Moſt minerals contain fixed air, which may be extracted to a certain degree by means of heat. Mr Krenger, diſtilling a greeniſh fuſible ſpar, which was luminous in the dark, obtained from it ſome permanently elaſtic fluid, which, like fixed air, cryſtallized a ſolution of fixed alkali. Mr Fontana, in his analyſis of the malachite, finds that that mineral contains a vaſt quantity of fixed air, as pure as that which is extracted from chalk by means of vitriolic acid.

From almoſt every metallic ore and earthy mineral ſome fixed air may be obtained, as well as from chalk, lime-ſtone, marble, marine ſhells, fixed and volatile alkali, and from magneſia alba, by means of a violent fire, or of acids.

In Mr Boyle's, Dr Boerhaave's, and Dr Hales's works, and in other books, the quantities of elaſtic fluid generated in various proceſſes, and by divers ſubſtances, are mentioned with diſtinction; but as thoſe writers were not acquainted with the characteriſtic properties of fixed air, we do not know whether the elaſtic fluid mentioned by them was pure fixed air or not.

Of Artificial Airs.

From animal substances, mixed with spirit of nitre, and sometimes heated a little, in order to facilitate the production of elastic fluid, Dr Priestley obtained, in general, fixed air; but whereas the fixed air produced by a similar process with vegetable substances is mostly mixed with nitrous air, this is mixed with an elastic fluid, which is seldom nitrous in a very slight degree, but is often phlogisticated air, viz. in such a state as extinguishes a candle, does not diminish common air, nor is itself diminished by nitrous air. Towards the end of the process, the Doctor remarks, "that when, by means of a strong heat, the produce of air is very rapid, and the air full of clouds, it is, like air, produced from vegetable substances in the same circumstances, slightly inflammable, burning with a lambent, greenish, or bluish flame."

182 Abundantly produced from calcareous substances.

(3.) *By acids.* Calcareous substances in general produce abundance of fixed air when acted upon by any acid, only the strongest acids will expel from them more fixed air than the weakest; and it happens to be peculiarly advantageous for those who want to produce a great quantity of fixed air, that the vitriolic acid is both the cheapest and strongest acid, and, upon the whole, the fittest for this purpose. The phenomena attending the production of fixed air from calcareous substances, &c. are themselves very remarkable, and furnish the subject of much speculation in philosophy.—The principal facts are the following. 1. When calcareous earths, alkalis, and magnesia, in their usual state, are mixed with acids, they cause an effervescence; and consequently the production of a permanently elastic fluid, namely, fixed air. 2. These substances retain the fixed air very obstinately; so that a strong fire is necessary to expel it from magnesia, and the strongest is not sufficient to expel it entirely from fixed alkalis, and especially from calcareous earths (A). When these substances are treated with acids, they yield the fixed air, because they have a stronger attraction to those acids than to the fixed air. 3. The calcareous earths which are insoluble in water, when deprived of the fixed air become soluble in it. Thus lime-stone is not soluble in water, but lime (viz. lime-stone deprived of its fixed air) is soluble in water. And if those substances, deprived of their fixed air, are put in a situation proper to recover their lost fixed air, they lose the property of being soluble in water. Thus, when lime-water is exposed to fixed air, the lime absorbs the fixed air; and, losing at the same time its property of being soluble in water, is precipitated from it in the state it was before calcination, viz. of a calcareous earth insoluble in water, and capable of effervescing with acids. 4. Alkalis, both fixed and volatile, when deprived of their fixed air, become more caustic, and more powerful solvents, incapable of crystallization, and of effervescing with acids. But if to those alkalis, and also earths rendered more caustic, their fixed air be restored, they acquire at once all the properties they had before they were deprived of the fixed air, viz. they become more mild, effervesce with acids, recover their weight, &c.

Those properties of calcareous earths and alkalis were ascertained by the learned Dr Black, who performed a variety of decisive and well-contrived experiments, upon which he formed a just theory, viz. that the causticity, sharpness, solubility, &c. of those substances, was owing to the fixed air being expelled from them; and that when they were combined with a proper quantity of fixed air, they were mild, &c. The Doctor gives the epithet of *mild* to those substances when they are combined with air, and of *caustic* when deprived of it; as caustic calcareous earth, caustic fixed alkali, &c. Among the other experiments, he connected two phials by means of a bent tube; in one of which he put some caustic spirit of sal ammoniac, and in the other some mild alkali, or mild calcareous earth; then pouring, through a hole made in the side of the latter phial, some acid upon the mild alkali, so as to produce some fixed air, which, passing through the tube into the other phial, combined with the spirit of sal ammoniac, and rendered it mild.

Easy methods of obtaining Fixable Air for occasional Experiments, &c.

(.) *By Fermentation.* Mix together equal parts of brown sugar and good yest of beer, to which add about twice the bulk of water. This mixture being put into a phial, to which a bent tube with a cork may be adapted, will yield a considerable quantity of fixed air, which may be received into a phial filled with quicksilver or water, as in the following process.

(2.) *By Acids.* Let a glass tube, open at both ends, be bent, by means of a blow-pipe and the flame of a candle, nearly into the shape of an S, as it is represented by AB, and fix a cork D to one of its extremities, so as to fit the neck of a common phial, that may hold about four or five ounce measures. The hole through the cork may be made with an iron wire red-hot, and the tube may be fastened in it with a bit of soft wax, so as not to let any air go through. Fill a similar phial, or any glass receiver K, with water, and invert it after the manner shown above, in a basin HI, about half filled with water Now put some chalk or marble, grossly powdered, into the bottle E, so as to fill about a fourth or fifth part of it, and upon it pour some water, just enough to cover the chalk; then add some oil of vitriol to it, which needs not be more than about the fourth or fifth part of the water. Immediately after, apply the cork D, with the tube AB, to the bottle, and putting it in the situation FG, let the extremity B of the tube pass through the water of the basin into the neck of the bottle K, which now must be kept up with the hand, or other convenient support, as it cannot rest upon the bottom of the basin. The mixture of chalk, &c. in the bottle FG, will immediately begin to effervesce, showing a frothing, and an intestine motion accompanied with heat, that may be felt by applying the hand to the outside of the fluid. The elastic fluid called *fixed air* is copiously emitted from this mixture, and passing through the bent tube, will go into the bottle K, as appears by the bubbles which come out of the tube, and, passing

Plate VIII. fig. 1.

Cavallo on Air.

(A) Chalk, lime-stone, &c. after being kept in a very strong fire for many hours, if they are put into acids, yield a considerable quantity of fixed air; which shows that the purest quick-lime contains some fixed air.

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ing through the water, ascend to the top of the inverted bottle. In proportion as the elastic fluid fills the bottle K, the water gradually descends, and at last is quite expelled from it; the bottle K then is filled with fixed air, and being corked under water, may be removed from the basin, and kept for use. Another bottle may then be filled with water, and may be inverted over the extremity of the bent tube in the place of K, which other bottle may be filled in a similar manner, and so on till the mixture in FG has finished to yield any fixed air.

If one of these bottles filled with fixed air be uncorked, and, holding it with the mouth upwards, a lighted wax taper, bent like L, or a small piece of it affixed to the extremity of a wire, be immediately let down in it, the flame will be instantly extinguished. The same thing will happen if a lighted piece of wood is let down in it.

Take a clean bowl, and putting the mouth of a bottle, filled with fixed air, in it, uncork it, and keep it in that situation for about a minute. The fixed air being specifically heavier than common air, will come out of the bottle, and will remain at the bottom of the bowl, whilst common air enters into the bottle; which bottle may now be removed; and, in order to show the real existence of the fixed air, which will immediately show its being heavier than common air, put a lighted wax-taper into the bowl, pretty near its bottom, which taper will be extinguished immediately. The air in this experiment must be agitated as little as it is possible. That the flame of the wax taper was really extinguished by the fixed air, may be easily proved in the following manner:—Blow once or twice into the bowl, by which means the fixed air will be expelled from it; and then, on letting down a lighted wax-taper in it as before, it will be found that it is no longer extinguished, but will burn very well, the bowl being now filled with common air. This experiment never fails of surprising the spectators, as it clearly exhibits two remarkable properties of a fluid, which they can neither see nor distinguish by the feeling.

Cavallo on Air.

When the bottle K is about half filled with fixed air, put a mark with a bit of soft wax on the outside of it, just coinciding with the level of the water in it, and immediately after shake the bottle; but taking care that its mouth be not lifted above the surface of the water in the basin. After having shaked it for about a minute, on intermitting the agitation, it will be found that the water is above the mark; which shows that some of the fixed air has been absorbed by it. Let this absorption be carried on as far as possible, by agitating the bottle repeatedly, and allowing time to let more fixed air be produced and enter into the bottle in proportion as the water absorbs it. Then appply the hand, or a finger, to the mouth of the bottle whilst under water; bring the bottle out, and turn it with the mouth upwards. The water then will be found to have acquired a pleasant acidulous taste. The water thus impregnated with fixed air changes the blue infusion of some vegetable substances into red; so that if a weak solution of heliotrope is mixed with it, or indeed if it is simply exposed to fixed air, the liquor acquires a reddish appearance. It also corrodes iron, and some other metals, much more easily than common water. But the greatest and most useful property of this acidulated water, or water impregnated with fixed air, is its being a powerful antiseptic. As the most used mineral waters are medicinal principally on account of their being impregnated with fixed air, besides which they generally contain some small portion of metal or salt dissolved; they may be imitated by impregnating water with fixed air, and then adding that quantity of salt or of metal, that by analysis the original mineral waters are found to contain.

183 Useful properties of fixed air.

It is for its great property of hindering putrefaction, that fixed air by itself, or incorporated with various fluids, especially with water, and that vegetables, sugar, and other substances which abound with fixed air, are very powerful remedies in putrid diseases. Sir John Pringle supposes, with great probability, that the frequent use of sugar and fresh vegetables, which at this time make up a considerable part of the diet of the European nations, prevents those putrid diseases and plagues which formerly were rather frequent.—Dr Macbride, showing experimentally that fixed air is discharged by such substances as form our common food, ascribes the preservation of the body from putrefaction in great measure to the fixed air, which in the ordinary process of digestion is disengaged from the aliment, and incorporates with the fluids of the body.

From the same property it may be also usefully applied to several œconomical purposes. Mr Henry found, that fixed air can preserve fruit for a considerable time. He tried a bunch of Italian grapes, which being suspended in the middle part of Dr Nooth's apparatus, and being supplied with plentiful streams of fixed air every day, was preserved without any signs of decay for about one month longer than a similar bunch suspended in a decanter containing common air. Strawberries and cherries he also found to be preserved without decay some days longer in fixed than in common air. Indeed, fixed air preserves not only fruit, but resists putrefaction in general. Dr Macbride, in his elegant Essays on Medical and Philosophical Subjects, has published various experiments which demonstrate this property of fixed air. He found, that not only good meat was preserved incorrupt for a considerable time, when exposed to fixed air; but that the putrefaction of substances actually putrid was impeded by this means, and even that those substances were restored from the putrescent to a sound state.

184 Resists putrefaction.

That putrefaction was checked by fermentation, was discovered by Sir John Pringle; and Dr Macbride observed, that this effect was owing to the fixed air produced in the act of fermentation. But it must be observed, that when the sound, or even putrid substances, expose a very great surface to the fixed air, as is the case with milk, bile, and other fluids impregnated with fixed air, and also with small bits of meat, then they are preserved for a considerable time: but large pieces of solid animal substances, as for instance roundish pieces of flesh of about half a pound weight, do not seem to remain incorrupt much longer in fixed than in common air; at least the difference is inconsiderable. Sir William Lee, baronet, in two of his letters to Dr Priestley, informs him of his having found, that flesh-meat, even in the hot season, could be preserved wholesome for several days, by only washing it two or three times a-day in water impregnated with fixed

Of Artificial Airs.

fixed air. "We have been enabled," says he, "to preserve meat as perfectly sweet and good to the extent of ten days, as at the first killing; and there seems no doubt it might be preserved much longer." He has even recovered some meat that had begun to change. This useful discovery, Sir William justly observes, may be very beneficial to the public, especially to butchers. "Particularly a butcher," says he, "who deals pretty largely, assures me he found the greatest success from it, and only objects that the veal was a little discoloured, though kept perfectly sweet."

Fixed air, as it combines with water, so it may be combined with other liquors. Beer, wine, and other fermented liquors, may be impregnated with fixed air, and by this means their sharpness may be restored, when they are become vapid, or, as it is commonly said, *dead*. The acidulous taste communicated by the impregnation of fixed air, cannot be discovered in beer, wines, and, in short, in such liquors which have much taste of their own. Milk acquires an acidulous taste by being impregnated with fixed air, and is thereby preserved incorrupt for some days; which affords a very easy expedient of preserving milk in those places where it cannot be had new very often.

185 Production of inflammable air.

§ 2. *To produce* INFLAMMABLE *Air*.—The process for making this sort of gas is the same as that for making fixed air: one of the materials only must be different, viz. iron-filings, or grossly powdered zinc, must be used instead of chalk; to which filings some oil of vitriol and water must be added, in the same proportion as in the fixed air, or rather a little more of oil of vitriol.

N.B. Instead of the filings of iron, small nails, or small bits of iron-wire, answer equally well.

The inflammable elastic fluid produced by this mixture has a displeasing smell, even when mixed with a very large quantity of common air; so that if any considerable quantity of it comes out of the bottle, before the cork with the bent tube be applied to it, &c. its smell may be perceived all over the room in which the experiment is made, but this smell is not particularly offensive.

When a bottle has been filled with this elastic fluid, stop the mouth of it with your thumb, or any stopper, and taking it out of the basin, bring it near the flame of a candle; and when the mouth of the bottle is very near it, remove the stopper, and the elastic fluid contained in the bottle will be immediately inflamed; and if the capacity of the bottle is nearly equal to four ounce-measures, it will continue burning quietly for about half a minute, the flame gradually descending lower and lower, as far as about the middle of the bottle, in proportion as the inflammable gas is consumed.

In this experiment we see, that inflammable air follows the general rule of all other combustible substances, namely, that of burning only when in contact with common air: thus the flame of this gas, whilst burning, is observable only on that surface of it which is contiguous to the common air; so that if the bottle

186 Phenomena.

be closed, the flame is put out immediately, because the air is intercepted from it. But if the inflammable air were put in such a situation as to expose a very great surface to the common air, it is plain, that by this means its combustion would be accelerated, so as to let it burn instantly, and go off with an explosion, caused by the sudden rarefaction of the air. In fact, this effect may be easily observed in the following manner: When the bottle is to be inverted into the basin, in order to let it be filled with the inflammable gas, instead of filling it entirely with water, let half of it remain filled with common air; then invert it, and let the other half, which is now filled with water, be filled with inflammable air after the usual manner; and when the bottle is full, remove it in the manner shown above, and approach it to the flame of the candle, by which means the inflammable air takes fire; but now it explodes all at once with a large flame and a considerable report, sometimes breaking the bottle in which it is contained. In this case, the bottle being filled with equal parts of inflammable and common air, these two elastic fluids were mixed together, so that almost every particle of the one touched every particle of the other, and hence the sudden combustion was occasioned. The force of this explosion is so very considerable, that some pistols have been contrived, which are charged with a mixture of air and inflammable gas, and being fired by means of an electric spark, are capable to drive a leaden bullet with great violence. Sometimes those pistols are made of glass (but in this case they are not charged with a bullet), and it is very diverting to show that pistols are charged and explode by the combustion of an invisible substance.

When a slender pipe is tied to the neck of a bladder, and the bladder is filled with inflammable air, after the manner described in the preceding experiment (viz. when the bladder was required to be filled with fixed air), two very pleasing experiments may be performed with it. First, the inflammable gas may be inflamed by applying the flame of the candle to the extremity of the pipe; and squeezing at the same time the bladder, a stream of fire will be formed in the air, which will last as long as the bladder contains any inflammable air; for this gas coming out of the pipe with violence, will continue inflamed for a considerable way in the air. Secondly, the extremity of the pipe may be dipped into a solution of soap, then removing it from the solution, and squeezing the bladder very gently, a ball of soap-water may be formed, including inflammable air: which ball, on account of the inflammable gas being much lighter than common air, as soon as it is detached from the pipe will ascend upwards, and will break by dashing against the ceiling, contrary to those commonly made by children, which in still air go downwards.—Whilst the ball is ascending, if the flame of the candle be approached to it, the film of soap-water will be instantly broke, and the inflammable air will take fire; thus a flame may be shown to be seemingly produced from a soap-ball.

By taking electric sparks in any kind of oil, spirit of wine, ether, or spirit of sal ammoniac, Dr Priestley obtained inflammable air. The oil, or other liquor, was confined in a glass tube by quicksilver, and a wire was cemented in the upper part of the tube, through which the sparks being sent, went to the quicksilver through the oil; but after that a few sparks had been taken, a quantity of inflammable air was generated, &c. Lest the production of inflammable air should be attributed to the cement which fastened the 187 Inflammable air obtained from various substances.

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the wire, the Doctor repeated the experiment with ether in a glass syphon; but the inflammable air was generated as before. This elastic fluid does not lose its inflammability by being passed several times from one vessel into another through water.

Alkaline air, by taking electric explosions in it, is changed into inflammable air.

By means of acids, inflammable air is obtained in greater abundance, and more readily. Iron, zinc, or tin, yield plenty of inflammable air when acted on by diluted vitriolic or marine acids.

If iron is put into strong vitriolic acid, the quantity of elastic fluid that is produced is very little, except heat be applied to the phial, for then the production of elastic fluid is more copious; but this elastic fluid is vitriolic acid air, mixed with a small portion of inflammable air, the proportional quantity of it being less when the acid is more concentrated.

Zinc, treated after the same manner, produces the like effects, except that it gives more elastic fluid, without the application of heat, than iron does; and the greatest part of the produced elastic fluid is inflammable.

In order to obtain the greatest quantity of inflammable air from iron or zinc, the vitriolic acid must be diluted with much water, as about one part of strong oil of vitriol to five or six parts of water. Dr Priestley found, that 11 grains of iron yielded $8\frac{1}{4}$ ounce-measures of inflammable air. According to Mr Cavendish, one ounce of zinc, dissolved either in the vitriolic or marine acid, yields a quantity of inflammable air equal to the bulk of 356 ounces of water; one ounce of iron, dissolved by means of vitriolic acid, yields a quantity of inflammable air equal to the bulk of 412 ounces of water; and one ounce of tin yields half as much inflammable air as iron does.

The solutions of iron, tin, copper, lead, and zinc, in the marine acid, produce marine acid air, and inflammable air, but in various quantities. The proportion of the former to the latter is as one to eight in iron, as one to six in tin, as three to one in copper and lead, and as one to ten in zinc. Regulus of antimony, dissolved in marine acid, with the application of heat, yields a small quantity of elastic fluid, which is weakly inflammable.

Dr Priestley obtained inflammable air, not only by dissolving various substances in marine acid, but also by exposing divers bodies to marine acid air, which is probably the purest part of the marine acid. Having admitted iron-filings to this acid air, they were dissolved by it pretty fast; half of the elastic fluid disappeared, and the rest was rendered unabsorbable by water, and inflammable. The same effect was produced by almost every substance which contains phlogiston, as by spirit of wine, oil of olives, spirit of turpentine, charcoal, phosphorus, bees-wax, sulphur, dry cork-wood, pieces of oak, ivory, pieces of roasted beef, and even some pieces of a whitish kind of flint.

A greater or smaller portion of the acid air was absorbed, and the rest sometimes was all inflammable, and often was partly acid air, which was soon absorbed on the admission of water, and partly inflammable. In short, it seems as if this acid air, having a great affinity with phlogiston, separates it from all those substances which contain it even in small quantity, and from that combination becomes inflammable.

By means of nitrous acid, inflammable air may be obtained from various substances containing phlogiston; but it is always mixed with nitrous air, and sometimes also with fixed and common or phlogisticated air. If two parts of spirit of wine, mixed with one part of nitrous acid, are put into a phial with a ground-stopple and tube, and the flame of a candle be applied to it, so as to heat it gradually, the inflammable air will be produced very readily; the inflammability of which is, however, not very permanent, for by a little washing in water it may be annihilated. In the solution of most substances in nitrous acid, it generally happens, that the elastic fluid, which is obtained towards the latter end of the process, possesses the property of being inflammable: thus iron, dissolved in nitrous acid, yields nitrous air; but when the nitrous air ceases to be produced, if the heat of a candle be applied to the solution, more elastic fluid will be produced which is inflammable. "The nitrous acid (says Dr Ingenhousz) when mixed with iron-filings in a very diluted state, gives, by the assistance of a moderate degree of heat, a mixture of different airs, partly fixed, partly common air, and partly phlogisticated air. See further the article Aerostation.

§ 3. *To produce Nitrous Air.*—This permanently elastic fluid is never found naturally, like fixed or inflammable air, but is entirely artificial. 188

Nitrous air is entirely artificial.

Either silver, copper, brass, iron, mercury, bismuth, or nickel, when mixed with nitrous acid, yield nitrous air in great quantities. Some of them, especially mercury, require the aid of heat in order to produce the elastic fluid; the flame of a candle applied to the phial is sufficient: but others, especially copper and iron, do not want the application of any heat. Gold, platina, and the regulus of antimony, when put in aqua regia, yield nitrous air pretty readily. Among the metals, lead yields nitrous air in the smallest quantity. "I poured (says Dr Priestley) smoking spirit of nitre into a phial with a ground-stopple and tube, containing $1\frac{1}{2}$ ounce-measure filled with small leaden shot, so as to leave no common air at all, either in the phial or in the tube; and I placed it so as to receive the air that might come from it in water. 189

From what substances produced.

After waiting an hour, in which little or no air was produced, I applied the flame of a candle, though not very near, to it: and in these circumstances I got about an ounce-measure of air: but upon some water rushing into the phial while the candle was withdrawn, air was produced very plentifully. I collected in all about a quarter of a pint; and might probably have got much more, but that the salt formed by the solution of the lead had so nearly closed up the tube, that I thought proper to discontinue the process. The air, both of the first and of the last produce, was of the same quantity; and so far nitrous, that two measures of common air, and one of this, occupied the space of two measures only; excepting that the very first and very last produce, mixed with common air, took up a little more room than that which I got in the middle of the process. When the air was produced very fast, it was exceedingly turbid, as if it had been filled with a white powder."

Among the semi-metals, zinc gives the weakest nitrous air, when dissolved in nitrous acid. The elastic fluid

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fluid produced from it is mostly phlogisticated air. From four pennyweights and 17 grains of zinc, dissolved in spirit of nitre diluted with an equal quantity of water, Dr Priestley obtained about 12 ounce-measures of very weak nitrous air. It occasioned a very slight effervescence when mixed with common air. The Doctor obtained nitrous air even from some flowers of zinc. "Having (says he) mixed a quantity of blue spirit of nitre with flowers of zinc, which were of a dull colour, and appeared from several experiments to contain a portion of phlogiston, it yielded, with the heat of a candle applied to the phial which contained it, strong nitrous air; when the common spirit of nitre, applied in the same manner, gave only phlogisticated air; the phlogiston of which came probably from the calx itself, though a small portion of it might have been in the nitrous acid, which I believe is never entirely free from it."

The quantity of nitrous air that may be obtained from various metals, is difficult to be ascertained, on account of the diversity occasioned by the strength of the acid, the various nature of the metallic substance, and the method of performing the experiments. The following is a table of the produces of nitrous air from various metals, extracted from Dr Priestley's first volume of Experiments and Observations; but which, as the author himself intimates, is far from being very accurate.

dwt.	grs.		
6	0	of silver yielded	17½ ounce-measures.
5	19	of quicksilver,	4½
1	2½	of copper,	14½
2	0	of brass,	21
0	20	of iron,	
1	5	of bismuth,	6
0	12	of nickel,	4

The various strength of the nitrous acid produces great diversity in the production of nitrous air. Thus, if copper is dissolved in strong nitrous acid, it will not produce the least quantity of nitrous air; but when dissolved in diluted nitrous acid, it produces a great quantity of that elastic fluid. The strong and pale-coloured nitrous acid should be diluted with at least two or three parts of water to one of the acid, for the easy production of nitrous air from copper and mercury.

The briskness of the effervescence, and the production of nitrous air, are promoted by heat, and also by letting the metallic substance present a great quantity of surface to the acids.

For the generality of experiments, no other degree of heat is required than that produced by the effervescence itself, except mercury be used, which requires the application of some heat. When the metal exhibits a very great surface to the acid, as is the case when filings are used, the effervescence and production of nitrous air are often much quicker than can be conveniently managed.

Copper or brass, when clipped into flat bits, each about two or three grains in weight, and about a quarter of a square inch in surface, and when dissolved in nitrous acid properly diluted, yield nitrous air very equably; but if iron be used, the pieces of it should be larger and fewer; in short, it should present a much less surface to the diluted acid; otherwise the increase of heat in the process, and the rapid production of elastic fluid, render the operation both difficult and dangerous for the operator.

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As the nitrous air is mostly necessary to try the goodness of respirable air, it is of great consequence to make it always of one constant degree of goodness; but this object is answered by dissolving substances of a very homologous nature in the nitrous acid; therefore it is plain, that the metals whose nature is more uniform must be preferred for this purpose. Accordingly, brass yields nitrous air of a more uniform nature than iron: copper is superior to brass; but pure mercury is still superior to copper: and indeed this is the metal which, considering its nature, uniformity of substance, and easy solution, is upon the whole the most useful for this purpose.

190 Pure mercury yields the best.

It has been generally observed, that solid vegetable substances, when dissolved in nitrous acid, yield more nitrous air than the animal substances, though this nitrous air is not so pure as that obtained from metals.

Sometimes it contains some fixed air, and a good deal of inflammable air, which is mostly produced towards the end of the process. On the other hand, the nitrous air extracted from animal-substances generally contains a good deal of phlogisticated air, and sometimes some fixed air. In order to obtain nitrous air from the solution of animal and vegetable substances in nitrous acid, often some degree of heat must be applied to the phial. The acid also sometimes must be very concentrated, and in other cases it must be diluted; but it is hardly worth while, or practicable, to determine with exactness all those particular cases.

To make Nitrous Air.—The metal, viz. copper, brass, or mercury, is first put into the bottle (which, as well as the whole process, is the same as that described for *fixed Air*), so as to fill about one-third of the same; then some water is poured into the bottle, so as just to cover the metal-filings; and lastly, the nitrous acid is added, the quantity of which, when strong, should be about one-third or half the quantity of the water. The smell of the nitrous gas is very penetrating and offensive, and occasions a red smoke as soon as it comes into contact with the common air; hence, whenever any of it escapes from the bottle, it may be observed not only by the smell, but also by the slight red colour.

In order to observe the principal property of this elastic fluid, which is that of diminishing the bulk of common air, let a glass tube, closed at one end, and about nine inches long, and half or three quarters of an inch in diameter, be filled with water, and inverted in water; then take a small phial, of about half an ounce-measure, filled with common air, and plunging it under the water contained in the same basin where the inverted tube is kept, let that quantity of air enter into the tube, which will go to the top of it, the water subsiding accordingly. Let a mark be made, either with a file or by sticking soft wax on the tube, just opposite to the surface of the water in it, which will mark how much of the tube is filled by that given measure of air. After the same manner, fill the same small phial (which we shall call the *measure*) again with air; throw that air into the tube, and put a mark on the tube coinciding with the level of the water in it. In this manner let four or five measures be marked on the tube. Now, if three measures of common air are put

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put into this tube, when filled with water and inverted, they will fill a ſpace of it as far as the third mark. The ſame thing will happen if three meaſures of nitrous inſtead of common air be put in it; but if two meaſures of common air and one meaſure of nitrous air, or one meaſure of the former and two of the latter, be introduced in it, they will fill a ſpace much ſhorter than the third mark. On the moment that theſe two kinds of elaſtic fluids come into contact, a reddiſh appearance is perceived, which ſoon vaniſhes, and the water, which at firſt nearly reaches the third mark, riſes gradually into the tube, and becomes nearly ſtationary after about two or three minutes; which ſhows that the diminution is effected gradually. See EUDIOMETER.

§ 4. *To procure* DEPHLOGISTICATED *Air*.—This is no other than exceedingly pure atmoſpherical air, entirely free from thoſe heterogeneous vapours which contaminate the air we commonly breathe. The eaſieſt method of procuring this air is to put ſome red-lead into the bottle, together with ſome good ſtrong oil of vitriol, but without any water. Let the red-lead fill about a quarter of the bottle, and the vitriolic acid be about the ſame quantity or very little leſs; then apply the bent tube to the bottle, and proceed in the ſame manner as above. But it muſt be remarked, that without heat this mixture of red-lead and vitriolic acid will not give any dephlogiſticated air, or it yields an inconſiderable quantity of it; for which reaſon the flame of a candle (that of a wax taper is ſufficient) muſt be applied under the bottom of the bottle; which for this purpoſe muſt be rather thin, otherwiſe it will be eaſily cracked (A). In this manner the red-lead will yield a good quantity of elaſtic fluid, the greateſt part of which is dephlogiſticated air; but not the whole quantity of it, for a good portion of fixed air comes out with it. In order to ſeparate the fixed from the dephlogiſticated air, the inverted bottle, when filled with the compound of both, as it is emitted from the red-lead, muſt be ſhook in the baſin for impregnating water with fixed air; by which means the water will abſorb the whole quantity of fixed air, and leave the dephlogiſticated air by itſelf.

From every experiment it appears, that dephlogiſticated air, if it could be readily obtained, and at a cheap rate, would be a moſt valuable manufacture. The heat communicated by means of it to burning fuel is incredible.

Theſe are not the only advantages which might be expected from dephlogiſticated air. It has been found by experience, that animals will live much longer in this kind of air than in an equal quantity of common air; whence it is ſuppoſed, that the breathing of it muſt be much more healthy, and contribute to longevity much more than the common atmoſphere. Nay, there are not wanting ſome who attribute the longevity of the Antediluvians to the great purity of the atmoſphere at that time; the whole maſs being afterwards tainted by the deluge, in ſuch a manner that it could never regain its former purity and ſalubrity. But all this as yet is mere conjecture; and excepting the ſingle fact, that animals live much longer in a quantity of dephlogiſticated than of common air, there is no evidence that the former contributes more to longevity than the latter. Dr Prieſtley even throws out a conjecture, that the uſe of dephlogiſticated air might perhaps wear out the ſyſtem much ſooner than common air, in the ſame manner as it conſumes fuel much faſter than common air. The great quantity, however, even of the pureſt air, which is requiſite to ſupport animal life, and the expence and trouble of the moſt ready methods of procuring it, have hitherto prevented any fair trial from being made. Yet philoſophers, conſidering the probability there is of this kind of air being ſalutary in many diſeaſes, have beſtowed ſome pains in attempting to find out methods of procuring it eaſily and in large quantity; concerning which we have the following obſervations in Cavallo's Treatiſe on Air.

"A man makes in general about 15 inſpirations in a minute, and takes in about 30 cubic inches of aërial fluid. But the air which has been once inſpired is not thereby much injured, and it may be reſpired again and again; ſo that, upon a very moderate calculation, and as appears from actual experiments often repeated, we may ſafely aſſert, that a perſon can breathe 400 cubic inches of good ordinary atmoſpheric air, at leaſt 30 times, without any inconvenience, i. e. it would ſerve for two minutes; after which that air, though much depraved, is ſtill in a ſtate of being breathed, but then it would occaſion ſome uneaſineſs. Now, ſuppoſing the dephlogiſticated air employed to be four times more pure than common air, 400 cubic inches of dephlogiſticated air would ſerve for at leaſt 120 reſpirations or eight minutes.

"But ſuppoſing that 30 inches of common air are completely phlogiſticated by a ſingle inſpiration, and changed for ſuch as is quite freſh, which indeed is the caſe in common reſpiration, then 450 cubic inches of common air will be requiſite for one minute's reſpiration, and 27,000 for one hour; and as dephlogiſticated air is ſuppoſed to be four times as good, the ſame quantity of it will ſerve for four hours. Indeed, if we could depend on the aſſertions of Mr Fontana, that by adding lime-water to abſorb the fixed air produced by reſpiration, an animal can live 30 times as long as without it, no doubt a much ſmaller quantity would ſerve."

But it is certain ſuch aſſertions cannot be true; becauſe, though the fixed air ſhould be abſorbed as ſoon as produced, the remaining quantity would ſtill be contaminated by phlogiſton. Nay, we are informed by Dr Prieſtley, who repeated Fontana's experiments, that

(A) In this operation the flame of the candle, when once applied, muſt be kept continually near it; and when the mixture does not produce any more elaſtic fluid, or the operation is required to be intermitted, care ſhould be taken to remove the extremity of the bent tube from the water firſt, and then to take off the flame of the candle from under the bottle; otherwiſe, if the flame of the candle be firſt removed, the materials within the bottle condenſing by cold, the water immediately enters, which in an inſtant fills the bottle, and generally breaks it.

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that animals *will not* live longer in a quantity of dephlogisticated air when it stands in contact with lime-water, than they will when no lime-water is used. In what manner a difference so enormous can take place, between philosophers in other respects so accurate, we can by no means determine. It is plain, however, that if 27,000 inches of common air are necessary for a person in one hour, the same quantity of dephlogisticated air cannot be breathed longer than four hours, nor even so long, with any real advantage. Mr Cavallo indeed allows only 12000 inches for four hours; but though this might no doubt sustain life for that time, the person must at best expect nothing from it superior to the common atmospere, if he was not materially injured by it.

A very ready method of procuring dephlogisticated air in large quantity, is by means of nitre; and on the supposition that 12,000 inches are sufficient for four hours, (or for 40 hours, as he limits the Abbé Fontana's supposition), Mr Cavallo proceeds in the following manner: "The instruments necessary for the production of dephlogisticated air from nitre are the following; viz. earthen retorts, or earthen vessels with a straight neck, somewhat in the shape of Florence flasks, but with a longer neck, these being cheaper than the retorts, and answering as well;—a small furnace, in which the earthen retort must be kept red-hot; a common chimney-fire is not sufficient. These furnaces may be very easily made out of large black lead crucibles. The nitre must be put into the retort or other vessel, so as to fill half or nearly three quarters of its belly; then a bent glass tube is luted to the neck of the earthen vessel, in such a manner as not to let any elastic fluid escape into the open air. The best lute or cement for this or similar purposes is made by mixing together whiting and drying oil. The retort being put into the furnace, must be surrounded with lighted charcoal, which is to be supplied according as it wastes: in short, the belly of the retort must be kept quite red-hot, or rather white-hot, for about three hours at least. If, instead of the retort, the other described earthen vessel be used, care should be had to place it with the neck as little inclined to the horizon as possible, lest the nitre should stop the neck and break it." The air is then to be received into large glass jars, as is usual in other experiments on air.

"The retort or other earthen vessel that is used for this purpose cannot serve for more than once, because it generally breaks in cooling; and besides, the decomposed nitre cannot easily be taken out of it. The retort capable of holding a pound of nitre (the quantity necessary for producing 12,000 cubic inches of dephlogisticated air) for this operation, costs at least half-a-crown; the other earthen vessels in the shape of Florence flasks, but with longer necks, cost about 18d. a-piece, or 2s.; so that the price of these vessels forms a considerable part of the expence. If glass vessels are employed, the nitre will not yield near so much air, though of a purer sort, because the glass vessels cannot endure such a great fire as the earthen ones. The retorts of metal, or at least of those metals which are most usually employed for this purpose, viz. iron and copper, phlogisticate in a great measure the air as soon as produced. Considering, then, all these circumstances, it appears, that when a person has all the usual apparatus and furnace, the expences at present necessary in London for the production of 12,000 cubic inches of dephlogisticated air, (viz. the price of one pound of nitre, of an earthen retort or other vessel, and of charcoal), amount to about 4s. or 4s. 6d."

Another method of preparing dephlogisticated air is, by blowing that of the common atmosphere thro' melted nitre. In this process the phlogiston contained in the atmosphere is gradually consumed, by detonating with the acid of the nitre, and therefore issues much more pure than before. This method has the appearance at first of being much easier and more commodious than the former; but as it is impossible to mix the atmospheric air so exactly with the melted nitre that every particle of the one may come in contact with every particle of the other, it is plain that the former method must be preferable; not to mention that it will be found exceedingly troublesome to blow the air through the nitre, as the latter will be perpetually apt to cool and concrete into lumps by the cold blast.

§ 5. *To procure* VITRIOLIC *Acid Air*.—This consists of the vitriolic acid, united with some phlogiston, which volatilizes and renders it capable of assuming the form of a permanently elastic fluid. To obtain it, some strong concentrated vitriolic acid must be put into the usual bottle, together with some substance capable of furnishing phlogiston. Olive oil answers very well. The oil of vitriol should be about three or four times as much as the sweet oil, and both together should fill about one-third or half the bottle. A gentle degree of heat is then required, in order to let these materials yield any elastic fluid; which may be done by applying the flame of a wax taper, as directed above for the production of dephlogisticated air.

§ 6. *To procure* MARINE *Acid Air*, which is no other than the marine acid itself, and which without any addition becomes a permanently elastic fluid; put some sea-salt, or common kitchen salt, into the usual bottle in which the materials for producing elastic fluids are generally put, so as to fill about a fourth part of it, and upon this salt pour a small quantity of good concentrated vitriolic acid; then apply the bent tube to the bottle, and introduce it through the quicksilver into the receiver, filled with and inverted in quicksilver after the usual method, and the elastic fluid is copiously produced.

§ 7. *To procure* NITROUS *Acid Air*.—This may be obtained from heated nitrous acid, the vapour of which acquires a permanent elasticity, and it has been found to remain uncondensed into a visible fluid by any cold to which it has been hitherto exposed. The great difficulty is to find a fluid capable of confining this acid air; because it is easily and abundantly absorbed by water, which is one of its properties by which it differs from nitrous air. It acts upon quicksilver, and also upon oils: hence its examination cannot be made but very imperfectly; for substances must be exposed to it, or mixed with it, whilst it is actually changing its nature by acting on the mercury or other fluid that confines it.

When water has absorbed a good quantity of this elastic fluid, it acquires the properties of nitrous acid; and when heated, it yields a large quantity of nitrous air,

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air, viz. a quantity many times greater than that which water is wont to imbibe of it by agitation, or by any known means.

When the nitrous acid air is combined with essential oils, a considerable effervescence and heat are produced, nearly in the same manner as when the nitrous acid itself is poured upon those oils.

§ 8. *Fluor Acid Air.*—Put some of those minerals called *fluors*, or *fusible spars*, pulverized, into the usual bottle, and upon it pour some concentrated oil of vitriol; then adapt the bent tube, &c. The fluor acid air is at first produced without the help of heat; but in a short time it will be necessary to apply the flame of a candle to the bottle, by which means a considerable quantity of this elastic fluid is obtained.

§ 9. *Alkaline Air.*—Let the usual bottle be about half filled with volatile spirit of sal ammoniac; and after applying the bent tube, &c. let the flame of a candle be brought under the bottle, by which means the alkaline air will be produced copiously.

Hepatic Air. See Sect. XI. *supra*.

INDEX.

Aeromancy || Aeronautica.

AEROMANCY, a ſpecies of divination performed by means of air, wind, &c. See DIVINATION, n° 5.

AEROMETRY, the ſcience of meaſuring the air. It comprehends not only the doctrine of the air itſelf, conſidered as a fluid body; but alſo its preſſure, elaſticity, rarefaction, and condenſation. But the term is at preſent not much in uſe, this branch of natural philoſophy being more frequently called Pneumatics. See PNEUMATICS.

AERONAUT, a perſon who attends and guides an air-balloon. See AEROSTATION and AIR-*Balloon*.

AERONAUTICA, from ἀηρ, and ναυτικος, derived from ναυς, ſhip; the art of ſailing in a veſſel or machine through the atmoſphere, ſuſtained as a ſhip in the ſea. See AEROSTATION.

Aerophylacea.

AEROPHYLACEA, a term uſed by naturaliſts for caverns or reſervoirs of air, ſuppoſed to exiſt in the bowels of the earth. Kircher ſpeaks much of aerophylacea, or huge caverns, replete with air, diſpoſed under ground; from whence, through numerous occult paſſages, that element is conveyed either to ſubterraneous receptacles of water, which, according to him, are hereby raiſed into ſprings or rivers, or into the funds of ſubterraneous fire, which are hereby fed and kept alive for the reparation of metals, minerals, and the like.

AEROSTATION

IS a ſcience newly introduced into the Encyclopœdia. The word, in its primitive ſenſe, denotes the ſcience of ſuſpending weights in the air; but in its modern acceptation, it ſignifies *aerial navigation*, or the art of navigating through the atmoſphere. Hence alſo the machines which are employed for this purpoſe are called *aeroſtats*, or *aeroſtatic* machines; and from their globular ſhape, *air-balloons*.

The romances of almoſt every nation have recorded inſtances of perſons being carried through the air, both by the agency of ſpirits and by mechanical inventions; but till the time of the celebrated Lord Bacon, no rational principle appears ever to have been thought of by which this might be accompliſhed. Before that time, indeed, Friar Bacon had written upon the ſubject; and many had been of opinion, that, by means of artificial wings, fixed to the arms or legs, a man might fly as well as a bird: but theſe opinions were thoroughly refuted by Borelli in his treatiſe *De Motu Animalium*, where, from a compariſon between the power of the muſcles which move the wings of a bird, and thoſe which move the arms of a man, he demonſtrates that the latter are utterly inſufficient to ſtrike the air with ſuch force as to raiſe him from the ground. It cannot be denied, however, that wings of this kind, if properly conſtructed, and dexterouſly managed, might be ſufficient to break the fall of a human body from an high place, ſo that ſome adventurers in this way might poſſibly come off with ſafety; though by far the greateſt number of thoſe who have raſhly adopted ſuch ſchemes, have either loſt their lives or limbs in the attempt.

1 Lord Bacon firſt publiſhed the true principles of aeroſtation.

2 Impoſſibility of flying by mechanical means.

3 Scheme of Biſhop Wilkins and Albertus de Saxonia.

In the year 1672, Biſhop Wilkins publiſhed a treatiſe, intitled, The Diſcovery of the New World; in which he mentions, though in a very indiſtinct and confuſed manner, the true principle on which the air is navigable; quoting, from Albertus de Saxonia and Francis Mendoca, "that the air is in ſome part of it navigable: and upon this ſtatic principle, any braſs or iron veſſel (ſuppoſe a kettle), whoſe ſubſtance is much heavier than that of water, yet being filled with the lighter air, it will ſwim upon it and not ſink. So ſuppoſe a cup or wooden veſſel upon the outward borders of this elementary air, the capacity of it being filled with fire, or rather ethereal air, it muſt neceſſarily, upon the ſame ground, remain ſwimming there, and of itſelf can no more fall than an empty ſhip can ſink." This idea, however, he did not by any means purſue, but reſted his hopes entirely upon mechanical motions, to be accompliſhed by the mere ſtrength of a man, or by ſprings, &c. and which have been demonſtrated incapable of anſwering any uſeful purpoſe.

4 Biſhop Lana's ſcheme.

The only perſon who brought his ſcheme of flying to any kind of rational principle was the Jeſuit Francis Lana, cotemporary with Biſhop Wilkins. He, being acquainted with the real weight of the atmoſphere, juſtly concluded, that if a globular veſſel were exhauſted of air, it would weigh leſs than before; and conſidering that the ſolid contents of veſſels increaſe in much greater proportion than their ſurfaces; he ſuppoſed that a metalline veſſel might be made ſo large, that, when emptied of its air, it would be able not only to raiſe itſelf in the atmoſphere, but to carry up paſſengers along with it; and he made a number of calculations neceſſary for putting the project in execution. But though the theory was here unexceptionable, the means propoſed were certainly inſufficient to accompliſh the end: for a veſſel of copper, made ſo thin as was neceſſary to make it float in the atmoſphere, would be utterly unable to reſiſt the external preſſure; which being demonſtrated by thoſe ſkilled in mechanics, no attempt was made on that principle.

5 Strange propoſal of Friar Guſman.

In the year 1709, however, as we were informed by a letter publiſhed in France in 1784, a Portugueſe projector, Friar Guſman, applied to the king for encouragement to his invention of a flying machine. The principle on which this was conſtructed, if indeed it had any principle, ſeems to have been that of the paper kite. The machine was conſtructed in form of a bird, and contained ſeveral tubes through which the wind was to paſs, in order to fill a kind of ſails, which were to elevate it; and when the wind was deficient, the ſame effect was to be performed by means of bellows concealed within the body of the machine. The aſcent was alſo to be promoted by the electric attraction of pieces of amber placed in the top, and by two ſpheres incloſing magnets in the ſame ſituation.

Theſe childiſh inventions ſhow the low ſtate of ſcience at that time in Portugal, eſpecially as the king, in order to encourage him to farther exertions in ſuch an uſeful invention, granted him the firſt vacant place in his college of Barcelos or Santarem, with the firſt profeſſorſhip in the Univerſity of Coimbra, and an annual penſion of 600,000 reis during his life. Of this De Guſman, it is alſo related, that in the year 1736, he made a wicker baſket of about ſeven or eight feet diameter, and covered with paper, which raiſed itſelf about 200 feet in the air, and the effect was generally attributed to witchcraft.

6 Poſſibility of bodies riſing in the air thought of by Dr Black and Mr Cavallo.

In the year 1766, Mr Henry Cavendiſh aſcertained the weight and other properties of inflammable air, determining it to be at leaſt ſeven times lighter than common air. Soon after which, it occurred to Dr Black, that perhaps a thin bag filled with inflammable air might be buoyed up by the common atmoſphere; and he thought of having the allantois of a calf prepared for this purpoſe: but his other avocations prevented him from proſecuting the experiment. The ſame thought occurred ſome years afterwards to Mr Cavallo; and he has the honour of being the firſt who made experiments on the ſubject. He firſt tried bladders; but the thinneſt of theſe, however well ſcraped and prepared, were found too heavy. He then tried Chineſe paper; but that proved ſo permeable, that the vapour paſſed through it like water through a ſieve. His experiments, therefore, made in the year 1782, proceeded

ed no farther than blowing up ſoap-bubbles with inflammable air, which aſcended rapidly to the cieling, and broke againſt it.

7 Aeroſtation diſcovered by Monſ. Montgolfier.

But while the diſcovery of the art of aeroſtation ſeemed thus on the point of being made in Britain, it was all at once announced in France, and that from a quarter whence nothing of the kind was to have been expected. Two brothers, Stephen and John Montgolfier, natives of Annonay, and maſters of a conſiderable paper-manufactory there, had turned their thoughts towards this project as early as the middle of the year 1782. The idea was firſt ſuggeſted by the natural aſcent of the ſmoke and clouds in the atmoſphere; and their deſign was to form an artificial cloud, by incloſing the ſmoke in a bag, and making it carry up the covering along with it. Towards the middle of November that year, the experiment was made at Avignon with a fine ſilk bag of a parallelopiped ſhape. By applying burning paper to the lower aperture, the air was rarefied, and the bag aſcended in the atmoſphere, and ſtruck rapidly againſt the ceiling. On repeating the experiment in the open air, it roſe to the height of about 70 feet.

8 Account of his experiments.

An experiment on a more enlarged ſcale was now projected; and a new machine, containing about 650 cubic feet, was made, which broke the cords that confined it, and roſe to the height of about 600 feet. Another of 35 feet in diameter roſe about 1000 feet high, and fell to the ground three quarters of a mile from the place where it aſcended. A public exhibition was next made on the 5th of June 1783, at Annonay, where a vaſt number of ſpectators aſſembled. An immenſe bag of linen, lined with paper, and containing upwards of 23,000 cubic feet, was found to have a power of lifting about 500 pounds, including its own weight. The operation was begun by burning chopped ſtraw and wool under the aperture of the machine, which immediately began to ſwell; and after being ſet at liberty, aſcended into the atmoſphere. In ten minutes it had aſcended 6000 feet; and when its force was exhauſted, it fell to the ground at the diſtance of 7668 feet from the place from whence it ſet out.

Soon after this, one of the brothers arrived at Paris, where he was invited by the Academy of Sciences to repeat his experiments at their expence. In conſequence of this invitation, he conſtructed, in a garden in the Fauxbourg of St Germain, a large balloon of an elliptical form. In a preliminary experiment, this machine lifted up from the ground eight perſons who held it, and would have carried them all off if more had not quickly come to their aſſiſtance. Next day the experiment was repeated in preſence of the members of the academy; the machine was filled by the combuſtion of 50 pounds of ſtraw made up in ſmall bundles, upon which about 12 pounds of chopped wool were thrown at intervals. The uſual ſucceſs attended this exhibition: The machine ſoon ſwelled; endeavoured to aſcend; and immediately after ſuſtained itſelf in the air, together with the charge of between 4 and 500 pounds weight. It was evident that it would have aſcended to a great height; but as it was deſigned to repeat the experiment before the king and royal family at Verſailles, the cords by which it was tied down were not cut. But in conſequence of a violent rain and wind which happened at this time, the machine was ſo far damaged, that it became neceſſary to prepare a new one for the time that it had been determined to honour the experiment with the royal preſence; and ſuch expedition was uſed, that this vaſt machine, of near 60 feet in height and 43 in diameter, was made, painted with water-colours both within and without, and finely decorated, in no more than four days and four nights. Along with this machine was ſent a wicker cage, containing a ſheep, a cock, and a duck, which were the firſt animals ever ſent through the atmoſphere. The full ſucceſs of the experiment was prevented by a violent guſt of wind which tore the cloth in two places near the top before it aſcended: However, it roſe to the height of 1440 feet; and, after remaining in the air about eight minutes, fell to the ground at the diſtance of 10,200 feet from the place of its ſetting out. The animals were not in the leaſt hurt.

9 Some animals ſafely ſent thro' the air.

10 Mr Pilatre de Rozier the firſt aerial navigator.

The great power of theſe aeroſtatic machines, and their very gradual deſcent in falling to the ground, had originally ſhowed that they were capable of tranſporting people through the air with all imaginable ſafety; and this was further confirmed by the experiment already mentioned. As Mr Montgolfier, therefore, propoſed to make a new aeroſtatic machine of a firmer and better conſtruction than the former, Mr Pilatre de Rozier offered himſelf to be the firſt aerial adventurer.

This new machine was conſtructed in a garden in the Fauxbourg of St Antoine. It was of an oval ſhape, about 48 feet in diameter and 74 in height; elegantly painted on the outſide with the ſigns of the zodiac, ciphers of the king's name, and other ornaments. A proper gallery, grate, &c. were appended in the manner afterwards deſcribed; ſo that it was eaſy for the perſon who aſcended to ſupply the fire with fuel, and thus keep up the machine as long as he pleaſed. The weight of the whole apparatus was upwards of 1600 pounds. The experiment was performed on the 15th of October 1783. Mr Pilatre having placed himſelf in the gallery, the machine was inflated, and permitted to aſcend to the height of 84 feet, where he kept it afloat for about four minutes and a half; after which it deſcended very gently: and ſuch was its tendency to aſcend, that it rebounded to a conſiderable height after touching the ground. Two days after, he repeated the experiment with the ſame ſucceſs as before; but the wind being ſtrong, the machine did not ſuſtain itſelf ſo well as formerly. On repeating the experiment in calmer weather, he aſcended to the height of 210 feet. His next aſcent was 262 feet; and in the deſcent, a guſt of wind having blown the machine over ſome large trees of an adjoining garden, Mr Pilatre ſuddenly extricated himſelf from ſo dangerous a ſituation, by throwing ſome ſtraw and chopped wool on the fire, which raiſed him at once to a ſufficient height. On deſcending again, he once more raiſed himſelf to a proper height by throwing ſtraw on the fire. Some time after, he aſcended in company with Mr Girond de Villette to the height of 330 feet; hovering over Paris at leaſt nine minutes in ſight of all the inhabitants, and the machine keeping all the while perfectly ſteady.

11 Account of his different voyages.

Theſe experiments had ſhown, that the aeroſtatic machines might be raiſed or lowered at the pleaſure of the

the persons who ascended: they had likewise discovered, that the keeping them fast with ropes was no advantage; but, on the contrary, that this was attended with inconvenience and hazard. On the 21st of November 1783, therefore, M. Pilatre determined to undertake an aerial voyage in which the machine should be fully set at liberty. Every thing being got in readiness, the balloon was filled in a few minutes; and M. Pilatre placed himself in the gallery, counterpoised by the Marquis d'Arlandes, who occupied the other side. It was intended to make some preliminary experiments on the ascending power of the machine: but the violence of the wind prevented this from being done, and even damaged the balloon essentially; so that it would have been entirely destroyed had not timely assistance been given. The extraordinary exertions of the workmen, however, repaired it again in two hours, and the adventurers set out. They met with no inconvenience during their voyage, which lasted about 25 minutes; during which time they had passed over a space of above five miles.—From the account given by the Marquis d'Arlandes, it appears that they met with several different currents of air; the effect of which was, to give a very sensible shock to the machine, and the direction of the motion seemed to be from the upper part downwards. It appears also that they were in some danger of having the balloon burnt altogether; as the Marquis observed several round holes made by the fire in the lower part of it, which alarmed him considerably, and indeed not without reason. However, the progress of the fire was easily stopped by the application of a wet spunge, and all appearance of danger ceased in a very short time.

12 Montgolfier's machines superseded by those filled with inflammable air.

This voyage of M. Pilatre and the Marquis d'Arlandes may be said to conclude the history of those aerostatic machines which are elevated by means of fire; for though many other attempts have been made upon the same principle, most of them have either proved unsuccessful or were of little consequence. They have therefore given place to the other kind, filled with inflammable air; which, by reason of its smaller specific gravity, is both more manageable, and capable of performing voyages of greater length, as it does not require to be supplied with fuel like the others. This was invented a very short time after the discovery had been made by M. Montgolfier. This gentleman had indeed designed to keep his method in some degree a secret from the world; but as it could not be concealed, that a bag filled with any kind of fluid lighter than the common atmosphere would rise in it, inflammable air was naturally thought of as a proper succedaneum for the rarefied air of M. Montgolfier.

13 Experiment of Messrs Charles and Roberts.

The first experiment was made by two brothers Messrs Roberts, and M. Charles a professor of experimental philosophy. The bag which contained the gas was composed of lutestring, varnished over with a solution of the elastic gum called *caoutchouc*; and that with which they made their first essay was only about 13 English feet in diameter. Many difficulties occurred in filling it with the inflammable air, chiefly owing to their ignorance of the proper apparatus; insomuch, that, after a whole day's labour from nine in the morning, they had got the balloon only one third part full. Next morning they were surprised to find that it had

14 In what manner a balloon partly filled may inflate itself.

fully inflated of itself during the night: but upon inquiry, it was found, that they had inadvertently left open a stop-cock connected with the balloon, by which the common air gaining access, had mixed itself with the inflammable air; forming a compound still lighter than the common atmosphere, but not sufficiently light to answer the purposes of aerostation. Thus they were obliged to renew their operation; and, by six o'clock in the evening of next day, they found the machine considerably lighter than the common air; and, in an hour after, it made a considerable effort to ascend. The public exhibition, however, had been announced only for the third day after; so that the balloon was allowed to remain in an inflated state for a whole day;

15 Loss of power in their balloon.

during which they found it had lost a power of ascent equal to about three pounds, being one seventh part of the whole. When it was at last set at liberty, after having been well filled with inflammable air, it was 35 pounds lighter than an equal bulk of common air. It remained in the atmosphere only three quarters of an hour, during which it had traversed 15 miles. Its sudden descent was supposed to have been owing to a rupture which had taken place when it ascended into the higher regions of the atmosphere.

16 First aerial voyage of Messrs Charles and Roberts.

The success of this experiment, and the aerial voyage made by Messrs Rozier and Arlandes, naturally suggested the idea of undertaking something of the same kind with a balloon filled with inflammable air. The machine used on this occasion was formed of gores of silk, covered over with a varnish made of *caoutchouc*, of a spherical figure, and measuring $27\frac{1}{2}$ feet in diameter. A net was spread over the upper hemisphere, and was fastened to an hoop which passed round the middle of the balloon. To this a sort of car, or rather boat, was suspended by ropes, in such a manner as to hang a few feet below the lower part of the balloon; and, in order to prevent the bursting of the machine, a valve was placed in it; by opening of which some of the inflammable air might be occasionally let out. A long silken pipe communicated with the balloon, by means of which it was filled. The boat was made of basket-work, covered with painted linen, and beautifully ornamented; being 8 feet long, 4 broad, and $3\frac{1}{2}$ deep; its weight 130 pounds. At this time, however, as at the former, they met with great difficulties in filling the machine with inflammable air, owing to their ignorance of the most proper apparatus. But at last, all obstacles being removed, the two adventurers took their seats at three quarters after one in the afternoon of the first of December 1783. Persons skilled in mathematics were conveniently stationed with proper instruments to calculate the height, velocity, &c. of the balloon. The weight of the whole apparatus, including that of the two adventurers, was found to be $604\frac{1}{2}$ pounds, and the power of ascent when they set out was 20 pounds; so that the whole difference betwixt the weight of this balloon and an equal bulk of common air was 624 pounds.

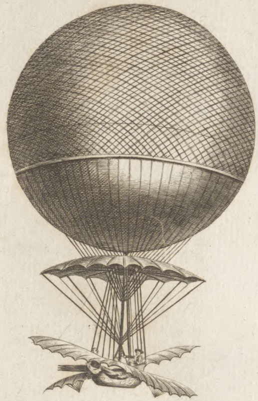
17 Specific gravity of the inflammable air in this first voyage.

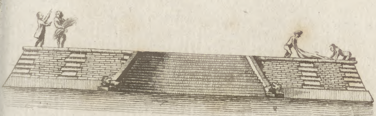
But the weight of common atmosphere displaced by the inflammable gas was calculated to be 771 pounds, so that there remains 147 for the weight of the latter; and this calculation makes it only $5\frac{1}{4}$ times lighter than common air.

At the time the balloon left the ground, the thermometer stood at 9° of Fahrenheit's scale, and the quicksilver in the barometer at 30.18 inches; and, by means

Montgolfiers Balloon.
Fauxbourg St. Antoine.

Blanchard's Balloon.





Verfailles
B.

Charles' & Roberts' B.
Champ de Mars.

Montgolfier's B.
Fauxbourg of St. Germain.

A Bell Sculp.t

means of the power of aſcent with which they left the ground, the balloon roſe till the mercury fell to 27 inches, from which they calculated their height to be about 600 yards. By throwing out ballaſt occaſionally as they found the machine deſcending by the eſcape of ſome of the inflammable air, they found it practicable to keep at pretty near the ſame diſtance from the earth during the reſt of their voyage; the quickſilver fluctuating between 27 and 27.65 inches, and the thermometer between 53° and 57°, the whole time. They continued in the air for the ſpace of an hour and three quarters, when they alighted at the diſtance of 27 miles from Paris; having ſuffered no inconvenience during their voyage, nor experienced any contrary currents of air, as had been felt by Meſſrs Pilatre and Arlandes. As the balloon

18 Mr Charles aſcends by himſelf.

ſtill retained a great quantity of inflammable gas, Mr Charles determined to take another voyage by himſelf. Mr Robert accordingly got out of the boat, which was thus lightened by 130 pounds, and of conſequence the aeroſtatic machine now had nearly as much power of aſcent. Thus he was carried up with ſuch velocity, that in twenty minutes he was almoſt 9000 feet high, and entirely out of ſight of terreſtrial objects. At the moment of his parting with the ground, the globe had been rather flaccid; but it ſoon began to ſwell, and the inflammable air eſcaped from it in great quantity through the ſilken tube. He alſo frequently drew the valve that it might be the more freely emitted, and the balloon effectually prevented from burſting. The inflammable gas being conſiderably warmer than the external air, diffuſed itſelf all round, and was felt like a warm atmoſphere; but in ten minutes the thermometer indicated a variation of temperature as great as that between the warmth of ſpring and the ordinary cold of winter.

19 Has a pain in his ear and jaw when in the higher regions.

His fingers were benumbed by the cold, and he felt a violent pain in his right ear and jaw, which he aſcribed to the dilatation of the air in theſe organs as well as to the external cold. The beauty of the proſpect which he now enjoyed, however, made amends for theſe inconveniences. At his departure the ſun was ſet on the valleys; but the height to which Mr Charles was got in the atmoſphere, rendered him again viſible, tho' only for a ſhort time. He ſaw, for a few ſeconds, vapours riſing from the valleys and rivers. The clouds ſeemed to aſcend from the earth, and collect one upon the other, ſtill preſerving their uſual form; only their

20 Various currents of wind and eddies in theſe regions.

colour was grey and monotonous for want of ſufficient light in the atmoſphere. By the light of the moon, he perceived that the machine was turning round with him in the air; and he obſerved that there were contrary currents which brought him back again. He obſerved alſo, with ſurpriſe, the effects of the wind, and

21 Streamers of his banners ſtand upwards.

that the ſtreamers of his banners pointed upwards; which, he ſays, could not be the effect either of his aſcent or deſcent, as he was moving horizontally at the time. At laſt, recollecting his promiſe of returning to his friends in half an hour, he pulled the valve, and accelerated his deſcent. When within 200 feet of the earth, he threw out two or three pounds of ballaſt, which rendered the balloon again ſtationary: but, in a little time afterwards, he gently alighted in a field about three miles diſtant from the place whence he ſet out; though, by making allowance for all the turnings and windings of the voyage, he ſuppoſes that he had gone through nine miles at leaſt. By the calculations of M. de Maunier, he roſe at this time not leſs than 10,500 feet high; a height ſomewhat greater than that of Mount Ætna. A ſmall balloon, which had been ſent off before the two brothers ſet out on their voyage, took a direction oppoſite to that of the large one, having met with an oppoſite current of air, probably at a much greater height.

22 Attempts to guide aeroſtatic machines in the atmoſphere.

The ſubſequent aerial voyages differ ſo little from that juſt now related, that any particular deſcription of them ſeems to be ſuperfluous. It had occurred to Mr Charles, however, in his laſt flight, that there might be a poſſibility of directing the machine in the atmoſphere; and this was ſoon attempted by Mr Jean-Pierre Blanchard, a gentleman who had, for ſeveral years before, amuſed himſelf with endeavours to fly by mechanical means, though he had never ſucceeded in the undertaking. As ſoon as the diſcovery of the aeroſtatic machines was announced, however, he reſolved to add the wings of his former machine to a balloon, and made no doubt that it would then be in his power to direct himſelf through the air at pleaſure. In his firſt attempt he was fruſtrated by the impetuoſity of a young gentleman, who inſiſted, right or wrong, on aſcending along with him. In the ſcuffle which enſued on this occaſion, the wings and other apparatus were entirely de-

23 Two firſt voyages of Mr Blanchard.

ſtroyed; ſo that Mr Blanchard was obliged to commit himſelf to the direction of the wind; and in another attempt it was found, that all the ſtrength he could apply to the wings was ſcarce ſufficient to counteract the impreſſion of the wind in any degree. In his voyage, he found his balloon, at a certain period, acted upon by two contrary winds; but, on throwing out four pounds of ballaſt, he aſcended to a place where he met with the ſame current he had at ſetting out from the earth.

24 His ſenſations while in the atmoſphere.

His account of the ſenſations he felt during this voyage, was ſomewhat different from that of Mr Charles; having, in one part of it, found the atmoſphere very warm, in another cold; and having once found himſelf very hungry, and at another time almoſt overcome by a propenſity to ſleep. The height to which he aroſe, as meaſured by ſeveral obſervations with mathematical inſtruments, was thought to be very little leſs than 10,000 feet; and he remained in the atmoſphere an hour and a quarter.

25 Voyage of Meſſ. Morveau and Bertrand.

The attempts of Mr Blanchard to direct his machine through the atmoſphere, were repeated in the month of April 1784 by Meſſrs Morveau and Bertrand, at Dijon, who raiſed themſelves with an inflammable air-balloon to the height, as it was thought, of 13,000 feet; paſſing through a ſpace of 18 miles in an hour and 25 minutes. Mr Morveau had prepared a kind of oars for directing the machine through the air; but they were damaged by a guſt of wind, ſo that only two of them remained serviceable; by working theſe, however, they were able to produce a ſenſible effect on the mo-

26 Third voyage of Mr Blanchard.

tion of the machine. In a third aerial voyage performed by Mr Blanchard, he ſeemed to produce ſome effect by the agitation of his wings, both in aſcending, deſcending, moving ſidewiſe, and even in ſome meaſure againſt the wind; however, this is ſuppoſed, with ſome probability, to have been a miſtake, as, in all his ſucceeding voyages, the effects of his machinery could not be perceived.

27 Second voyage of Meſſ. Charles and Robert.

The ſucceſs of Meſſrs Charles and Robert in their former experiments, encouraged them ſoon to repeat them, with the addition of ſome machinery to direct their courſe. Having enlarged their former balloon to the ſize of an oblong ſpheroid 46½ feet long and 27½ in diameter, they made it to float with its longeſt part parallel to the horizon. The wings were made in the ſhape of an umbrella without the handle, to the top of which a ſtick was faſtened parallel to the aperture of the umbrella. Five of theſe were diſpoſed round the boat, which was near 17 feet in length. The balloon was filled in three hours, and, with the addition of 450 pounds of ballaſt, remained *in æquilibrio* with the atmoſphere. About noon, on the 19th of September 1784, they began to aſcend very gently in conſequence of throwing out 24 pounds of ballaſt, but were ſoon obliged to throw out eight pounds more in order to avoid running againſt ſome trees. Thus they roſe to the height of 1400 feet, when they perceived ſome thunder-clouds near the horizon. On this they aſcended and deſcended, to avoid the danger, as the wind blew directly towards the threatening clouds; but, from the height of 600 feet to that of 4200 above the ſurface of the earth, the current was quite uniform and in one direction. During their voyage they loſt one of their oars; but found, that by means of thoſe which remained, they conſiderably accelerated their courſe. From the account of their voyage, it would ſeem that they had paſſed ſafely through the thunder-clouds; as we are informed, that, about 40 minutes after three, they heard a loud clap of thunder; and, three minutes after, another much louder; at which time the thermometer ſunk from 77 to 59 degrees. This ſudden cold, occaſioned by the approach of the clouds, condenſed the inflammable air ſo that the balloon deſcended very low, and they were obliged to throw out 40 pounds of ballaſt; yet on examining the heat of the air within the balloon, they found it to be 104°, when that of the external atmoſphere was only 63. When they had got ſo high that the mercury in the barometer ſtood only at 23,94 inches, they found themſelves becalmed; ſo that the machine did not go even at the rate of two feet in a ſecond, though it had before gone at the rate of 24 feet in a ſecond. On this they determined to try the effect of their oars to the utmoſt; and, by working them for 35 minutes, and marking the ſhadow of the balloon on the ground, they found, in that time, that they had deſcribed the ſegment of an ellipſis whoſe longeſt diameter was 6000 feet. After having travelled about 150 miles, they deſcended, only on account of the approach of night, having ſtill 200 pounds of ballaſt left.

28 Are in danger of running into thunder-clouds.

29 Heat of the air within their balloon.

30 Effect of their oars in moving the machine.

Their concluſion, with regard to the effect of their wings, is as follows: "Thoſe experiments ſhow, that far from going againſt the wind, as is ſaid by ſome perſons to be poſſible in a certain manner, and ſome aeronauts pretend to have actually done, we only obtained, by means of two oars, a deviation of 22 degrees: it is certain, however, that if we could have uſed our four oars, we might have deviated about 40 degrees from the direction of the wind, and as our machine would have been capable of carrying ſeven perſons, it would have been eaſy for five perſons to have gone, and to have put in action eight oars, by means of which a deviation of about 80 degrees would have been obtained.

"We had already obſerved (ſay they), that if we did not deviate more than 22 degrees, it was becauſe the wind carried us at the rate of 24 miles an hour; and it is natural to judge, that, if the wind had been twice as ſtrong as it was, we ſhould not have deviated more than one-half of what we actually did; and, on the contrary, if the wind had been only half as ſtrong, our deviation would have been proportionably greater."

31 Contrivances uſed to prevent the waſte of inflammable air.

Having thus related all that has been done with regard to the conducting of aeroſtatic machines through the atmoſphere, we ſhall now relate the attempts that have been made to leſſen their expence, by falling upon ſome contrivance to aſcend without throwing out ballaſt, and to deſcend without loſing any of the inflammable air. The firſt attempt of this kind was made by the Duke de Chartres; who, on the 15th of July 1784, aſcended with the two brothers, Charles and Robert, from the Park of St Cloud. The balloon was of an oblong form, made to aſcend with its longeſt diameter horizontally, and meaſured 55 feet in length and 24 in breadth. It contained within it a ſmaller balloon filled with common air; by blowing into which with a pair of bellows, and thus throwing in a conſiderable quantity of common air, it was ſuppoſed that the machine would become ſufficiently heavy to deſcend, eſpecially as, by the inflation of the internal bag, the inflammable air in the external one would be condenſed into a ſmaller ſpace, and thus become ſpecifically heavier. The voyage, however, was attended with ſuch circumſtances as rendered it impoſſible to know what would have been the event of the ſcheme. The power of aſcent with which they ſet out, ſeems to have been very great; as, in three minutes after parting with the ground, they were loſt in the clouds, and involved in ſuch a denſe vapour that they could ſee neither the ſky nor the earth. In this ſituation they ſeemed to be attacked by a whirlwind, which, beſides turning the balloon three times round from right to left, ſhocked, and beat it ſo about, that they were rendered incapable of uſing any of the means propoſed for directing their courſe, and the ſilk ſtuff of which the helm had been compoſed was even torn away. No ſcene can be conceived more terrible than that in which they were now involved. An immenſe ocean of ſhapeleſs clouds rolled one upon another below them, and ſeemed to prevent any return to the earth, which ſtill continued inviſible, while the agitation of the balloon became greater every moment. In this extremity they cut the cords which held the interior balloon, and of conſequence it fell down upon the aperture of the tube that came from the large balloon into the boat, and ſtopped it up. They were then driven upwards by a guſt of wind from below, which carried them to the top of that ſtormy vapour in which they had been involved. They now ſaw the ſun without a cloud; but the heat of his rays, with the diminiſhed denſity of the atmoſphere, had ſuch an effect on the inflammable air, that the balloon ſeemed every moment ready to burſt. To prevent this they introduced a ſtick through the tube, in order to puſh away the inner balloon from its aperture; but the expanſion of the inflammable air puſhed it ſo cloſe, that

32 Voyage of the Duke de Chartres.

33 Is involved in dark clouds and attacked by a whirlwind.

all

all attempts of this kind proved ineffectual. It was now, however, become abſolutely neceſſary to give vent to a very conſiderable quantity of the inflammable air; for which purpoſe the Duke de Chartres himſelf bored two holes in the balloon, which tore open for the length of ſeven or eight feet. On this they deſcended with great rapidity; and would have fallen into a lake, had they not haſtily thrown out 60 pounds of ballaſt, which enabled them juſt to reach the water's edge.

The ſucceſs of the ſcheme for raiſing or lowering aeroſtatic machines by means of bags filled with common air being thus rendered dubious, another method was thought of. This was to put a ſmall aeroſtatic machine with rarefied air under an inflammable air-balloon, but at ſuch a diſtance that the inflammable air of the latter might be perfectly out of the reach of the fire uſed for inflating the former; and thus, by increaſing or diminiſhing the fire in the ſmall machine, the abſolute weight of the whole would be conſiderably diminiſhed or augmented. This ſcheme was unhappily put in execution by the celebrated Mr Pilatre de Rozier, and another gentleman named Mr Romaine. Their inflammable-air balloon was about 37 feet in diameter, and the power of the rarefied-air one was equivalent to about 60 pounds. They aſcended without any appearance of danger or ſiniſter accident; but had not been long in the atmoſphere when the inflammable-air balloon was ſeen to ſwell very conſiderably, at the ſame time that the aeronauts were obſerved, by means of teleſcopes, very anxious to get down, and buſied in pulling the valve and opening the appendages to the balloon, in order to facilitate the eſcape of as much inflammable air as poſſible. A ſhort time after this the whole machine was on fire, when they had then attained the height of about three quarters of a mile from the ground. No exploſion was heard; and the ſilk which compoſed the air-balloon continued expanded, and ſeemed to reſiſt the atmoſphere for about a minute; after which it collapſed, and the remains of the apparatus deſcended along with the two unfortunate travellers ſo rapidly, that both of them were killed. Mr Pilatre ſeemed to have been dead before he came to the ground; but Mr Romaine was alive when ſome perſons came up to the place where he lay, though he expired immediately after.

34 Unfortunate voyage and death of Meſſ. Rozier and Romaine.

These are the moſt remarkable attempts that have been made to improve the ſcience of aeroſtation; tho' a great number of other expeditions through the atmoſphere have taken place. But of all the voyages which had been hitherto projected or put in execution, the moſt daring was that of Mr Blanchard and Dr Jeffries acroſs the ſtraits of Dover which ſeparate Britain from France. This took place on the 7th of January 1785, being a clear froſty morning, with a wind, barely perceptible, at N. N. W. The operation of filling the balloon began at 10 o'clock, and, at three quarters after twelve, every thing was ready for their departure. At one o'clock Mr Blanchard deſired the boat to be puſhed off, which now ſtood only two feet diſtant from that precipice ſo finely deſcribed by Shakeſpeare in his tragedy of King Lear. As the balloon was ſcarcely ſufficient to carry two, they were obliged to throw out all their ballaſt except three bags of 10 pounds each; when they at laſt roſe gently, though making very little way on account of there being ſo little wind. At a quarter after one o'clock, the barometer, which on the cliff ſtood at 29.7 inches, was now fallen to 27.3, and the weather proved fine and warm. They had now a moſt beautiful proſpect of the ſouth coaſt of England, and were able to count 37 villages upon it. After paſſing over ſeveral veſſels, they found that the balloon, at 50 minutes after one, was deſcending, on which they threw out a ſack and an half of ballaſt; but as they ſaw that it ſtill deſcended, and that with much greater velocity than before, they now threw out all the ballaſt. This ſtill proving ineffectual, they next threw out a parcel of books they carried along with them, which made the balloon aſcend, when they were about midway betwixt France and England. At a quarter paſt two, finding themſelves again deſcending, they threw away the remainder of their books, and, ten minutes after, they had a moſt enchanting proſpect of the French coaſt. Still, however, the machine deſcended; and as they had now no more ballaſt, they were fain to throw away their proviſions for eating, the wings of their boat, and every other moveable they could eaſily ſpare. "We threw away, ſays Dr Jeffries, our only bottle, which, in its deſcent, caſt out a ſteam like ſmoke, with a ruſhing noiſe; and when it ſtruck the water, we heard and felt the ſhock very perceptibly on our car and balloon." All this proving inſufficient to ſtop the deſcent of the balloon, they next threw out their anchors and cords, and at laſt ſtripped off their cloths, faſtening themſelves to certain ſlings, and intending to cut away the boat as their laſt reſource. They had now the ſatisfaction, however, to find that they were riſing; and as they paſſed over the high lands between Cape Blanc and Calais, the machine roſe very faſt, and carried them to a greater height than they had been at any former part of their voyage. They deſcended ſafely among ſome trees in the foreſt of Guiennes, where there was juſt opening enough to admit them.

35 Voyage of Meſſ. Blanchard and Jeffries acroſs the Straits of Dover.

It would be tedious as well as unneceſſary to recount all the other aerial voyages that have been performed in our own or other countries: It appeared ſufficient for the purpoſe of this article to notice thoſe which were moſt remarkable and intereſting; and therefore an account of the ingenious Mr Baldwin's excurſion from Cheſter, alluded to above, ſhall now cloſe our enumeration.

On the 8th of September 1785, at forty minutes paſt one P. M. Mr Baldwin aſcended from Cheſter in Mr Lunardi's (A) balloon. After traverſing in a variety of different directions, he firſt alighted, at 28 minutes after three, about twelve miles from Cheſter, in the neighbourhood of Frodſham; then reaſcending and purſuing his excurſion, he finally landed at Rixton moſs, five miles N. N. E. of Wavington, and 25 miles from Cheſter. Mr Baldwin has publiſhed his Obſervations and Remarks made during his voyage, and taken from minutes. Our limits will not admit of relating many

(A) Of this gentleman's adventurous excurſions moſt people have been witneſſes; and therefore it appeared unneceſſary to take up room with an account of them in this article.

many of his obfervations; but the few following are fome of the moft important and curious. "The fenfation of afcending is compared to that of a ftrong preffure from the bottom of the car upwards againft the foles of his feet At the diftance of what appeared to him feven miles from the earth, though by the barometer fcarcely a mile and a half, he had a grand and moft enchanting view of the city of Chefter and its adjacent places below. The river Dee appeared of a red colour; the city very diminutive; and the town entirely blue. The whole appeared a perfect plain, the higheft building having no apparent height, but reduced all to the fame level, and the whole terreftrial profpect appeared like a coloured map. Juft after his firft afcent, being in a well-watered and maritime part of the country, he obferved a remarkable and regular tendency of the balloon towards the fea; but fhortly after rifing into another current of air, he efcaped the danger: this upper current, he fays, was vifible to him at the time of his afcent, by a lofty found ftratum of clouds flying in a fafe direction. The perfpective appearance of things to him was very remarkable. The loweft bed of vapour that firft appeared as cloud was pure white, in detached fleeces, increafing as they rofe: they prefently coalefced, and formed, as he expreffes it, a fea of cotton, tufting here and there by the action of the air in the undifturbed part of the clouds. The whole became an extended white floor of cloud, the upper furface being fmooth and even. Above this white floor he obferved, at great and unequal diftances, a vaft affemblage of thunder-clouds, each parcel confifting of whole acres in the denfeft form: he compares their form and appearance to the fmoke of pieces of ordnance, which had confolidated as it were into maffes of fnow, and penetrated through the upper furface or white floor of common clouds, there remaining vifible and at reft. Some clouds had motions in flow and various directions, forming an appearance truly ftupendous and majeftic. He endeavours to convey fome idea of the fcene by a figure; (and from which fig. 13. of 2d Plate II. is copied). *A* reprefents a circular view he had from the car of the balloon, himfelf being over the centre of the view, looking down on the white floor of clouds and feeing the city of Chefter through an opening, which difcovered the landfcape below, limited by furrounding vapour, to lefs than two miles in diameter. The breadth of the outer margin defines his apparent height in the balloon (viz. 4 miles) above the white floor of clouds. Mr Baldwin alfo gives a curious defcription of his tracing the fhadow of the balloon over tops of volumes of clouds. At firft it was fmall, in fize and fhape like an egg; but foon encreafed to the magnitude of the fun's difc, ftill growing larger, and attended with a moft captivating appearance of an iris encircling the whole fhadow at fome diftance round it, the colours of which were remarkably brilliant. The regions did not feel colder, but rather warmer, than below. The fun was hotteft to him when the balloon was ftationary. The difcharge of a cannon when the balloon was at a confiderable height, was diftinctly heard by the aeronaut; and a difcharge from the fame piece, when at the height of 30 yards, fo difturbed him as to oblige him for fafety to lay hold firmly of the cords of the balloon. At a confiderable height he poured down a pint-bottle full of water; and as the air did not oppofe a refiftance fufficient to break the fteam into fmall drops, it moftly fell down in large drops. In the courfe of the balloon's tract it was found much affected by the water (a circumftance obferved in former aerial voyages). At one time the direction of the balloon kept continually over the water, going directly towards the fea, fo much as to endanger the aeronaut; the mouth of the balloon was opened, and he in two minutes defcended into an under current blowing from the fea: he kept defcending, and landed at Bellair farm in Rinfley, 12 miles from Chefter. Here he lightened his car by 31 pounds, and inftantly reafcending, was carried into the interior part of the country, performing a number of different manœuvres. At his greateft altitude he found his refpiration free and eafy. Several bladders which he had along with him crackled and expanded very confiderably. Clouds and land, as before, appeared on the fame level. By way of experiment, he tried the upper valve two or three times, the neck of the balloon being clofe; and remarked, that the efcape of the gas was attended with a growling noife like millftones, but not near fo loud. Again, round the fhadow of the balloon, on the clouds he obferved the iris. A variety of other circumftances and appearances he met with, is fancifully defcribed; and at 53 minutes paft three he finally landed. 36

Ufes of aeroftation.

The frequency of aerial voyages, accompanied with particular details of trifling and uninterefting circumftances, and apparently made with a view to promote the intereft of particular perfons, regardlefs of any advancement in knowledge, have now funk the fcience of aeroftation fo low in the opinion of moft people, that before giving any account of the moft proper method of conftructing thefe machines, it may feem neceffary to premife fomething concerning the ufes to which they may poffibly be applied. Thefe, according to Mr Cavallo, are the following.

"The fmall balloons, efpecially thofe made of paper, and raifed by means of fpirit of wine, may ferve to explore the direction of the winds in the upper regions of the atmofphere, particularly when there is a calm below: they may ferve for fignals in various circumftances, in which no other means can be ufed; and letters or other fmall things may be eafily fent by them, as for inftance from fhips that cannot fafely land on account of ftorms, from befieged places, iflands, or the like. The larger aeroftatic machines may anfwer all the abovementioned purpofes in a better manner; and they may, befides, be ufed as a help to a perfon who wants to afcend a mountain, a precipice, or to crofs a river; and perhaps one of thofe machines tied to a boat by a long rope, may be, in fome cafes, a better fort of fail than any that is ufed at prefent. The largeft fort of machines, which can take up one or more men, may evidently be fubfervient to various œconomical and philofophical purpofes. Their conveying people from place to place with great fwiftnefs, and without trouble, may be of effential ufe, even if the art of guiding them in a direction different from that of the wind fhould never be difcovered. By means of thofe machines the fhape of certain feas and lands may be better afcertained; men may afcend to the tops of mountains they never vifited before; they may be carried over marfhy and

and dangerous grounds; they may by that means come out of a befieged place, or an ifland; and they may, in hot climates, afcend to a cold region of the atmofphere, either to refrefh themfelves, or to obferve the ice, which is never feen below; and, in fhort, they may be thus taken to feveral places, to which human art hitherto knew of no conveyance.

"The philofophical ufes, to which thefe machines may be fubfervient, are numerous indeed; and it may be fufficient to fay, that hardly any thing which paffes in the atmofphere is known with precifion, and that principally for want of a method of afcending into it. The formation of rain, of thunder-ftorms, of vapours, hail, fnow, and meteors in general, require to be attentively examined and afcertained. The action of the barometer, the refraction and temperature of the air in various regions, the defcent of bodies, the propagation of found, &c. are fubjects which all require a feries of obfervations and experiments, the performance of which could never have been properly expected before the difcovery of aeroftatic machines."

To thofe ufes we may add the gratification of curiofity and pleafure as a very ftrong inducement to the practice of an art, in which, with any tolerable degree of caution, there appears not to be the fmalleft danger. Every one who has tried the experiment teftifies, that the beauty of the profpect afforded by an afcent, or the pleafure of being conveyed through the atmofphere, cannot be exceeded. No one has felt the leaft of that giddinefs confequent upon looking from the top of a very high building or of a precipice, nor have they any of the ficknefs arifing from the motion of a veffel at fea. Many have been carried by balloons at the rate of 30, 40, or even 50 miles an hour, without feeling the leaft inconvenience, or even agitation of the wind; the reafon of which is, that as the machine moves with nearly the velocity of the wind itfelf, they are always in a calm, and without uneafinefs. Some have apprehended danger from the electricity of the atmofphere; and have thought that a ftroke of lightning, or the fmalleft electric fpark, happening near a balloon, might fet fire to the inflammable air, and deftroy both the machine and the adventurers. Mr Cavallo has fuggefted feveral confiderations for diminifhing apprehenfions of this kind. Balloons have been already raifed in every feafon of the year, and even when thunder has been heard, without injury. In cafe of danger, the aeronauts may either defcend to the earth, or afcend above the region of the clouds and thunder-ftorms. Befides, as balloons are formed of materials that are not conductors of electricity, they are not likely to receive ftrokes, efpecially as by being encompaffed with air they ftand infulated. Moreover, inflammable air by itfelf, or unmixed with a certain quantity of common air, will not burn; fo that if an electric fpark fhould happen to pafs through the balloon, it would not fet fire to the inflammable air, unlefs a hole was made in the covering.

37
Principles of aeroftation.

The general principles of aeroftation are fo little different from thofe of hydroftatics, that it may feem fuperfluous to infift much upon them. It is a fact univerfally known, That when a body is immerfed in any fluid, if its weight be lefs than an equal bulk of that fluid, it will rife to the furface; but if heavier, it will fink; and if equal, it will remain in the place where it is left. For this reafon fmoke afcends into the atmofphere, and heated air in that which is colder. The afcent of the latter is fhown in a very eafy and fatisfactory manner by bringing a red-hot iron under one of the fcales of a balance, by which the latter is inftantly made to afcend; for, as foon as the red-hot iron is brought under the fcale, the hot air being lighter than that which is colder, afcends, and ftrikes the bottom, which is thus impelled upwards, and the oppofite fcale defcends, as if a weight had been put into it.

38
Experiments fhowing the impulfe of heated air.

Upon this fimple principle depends the whole theory of aeroftation; for it is the fame thing whether we render the air lighter by introducing a quantity of heat into it, or inclofing a quantity of gas fpecifically lighter than the common atmofphere in a certain fpace; both will afcend, and for the fame reafon. A cubic foot of air, by the moft accurate experiments, has been found to weigh about 554 grains, and to be expanded by every degree of heat, marked on Fahrenheit's thermometer, about $\frac{1}{500}$th part of the whole. By heating a quantity of air, therefore, to 500 degrees of Fahrenheit, we will juft double its bulk when the thermometer ftands at 54 in the open air, and in the fame proportion we will diminifh its weight; and if fuch a quantity of this hot air be inclofed in a bag, that the excefs of the weight of an equal bulk of common air weighs more than the bag with the air contained in it, both the bag and air will rife into the atmofphere, and continue to do fo until they arrive at a place where the external air is naturally fo much rarefied that the weight becomes equal; and here the whole will float.

The power of hot air in raifing weights, or rather that by which it is itfelf impelled upwards, may be fhown in the following manner: Roll up a fheet of paper into a conical form, and, by thrufting a pin into it near the apex, prevent it from unrolling. Faften it then, by its apex, under one of the fcales of a balance by means of a thread, and, having properly counterpoifed it by weights, put it into the oppofite fcale; apply the flame of a candle underneath, you will inftantly perceive the cone to arife, and it will not be brought into equilibrium with the other but by a much greater weight than thofe who have never feen the experiment would believe. If we try this experiment with more accuracy, by getting proper receptacles made which contain determinate quantities of air, we will find that the power of the heat depends much more on the capacity of the bag which contains it than could well be fuppofed. Thus, let a cubical receptacle be made of a fmall wooden frame covered with paper capable of containing one foot of air, and let the power of a candle be tried with this as above directed for the paper cone. It will then be found that a certain weight may be raifed; but a much greater one will be raifed by having a receptacle of the fame kind which contains two cubic feet; a ftill greater by one of three feet; a yet greater by one of four feet, &c. and this even though the very fame candle be made ufe of; nor is it known to what extent even the power of this fmall flame might be carried.

39
Rarefied-air balloons ought to be made as large as poffible.

From thefe experiments it appears, that in the aeroftatic machines conftructed on Montgolfier's plan, it muft be an advantage to have them as large as poffible; becaufe

because a smaller quantity of fire will then have a greater effect in raising them, and the danger from that element, which in this kind of machines is chiefly to be dreaded, will be in a great measure avoided. On this subject it may be remarked, that as the cubical contents of a globe, or any other figure of which balloons are made, increase much more rapidly than their surfaces, there must ultimately be a degree of magnitude at which the smallest imaginable heat would raise any weight whatever. Thus, supposing any aerostatic machine capable of containing 500 cubic feet, and the air within it to be only one degree hotter than the external atmosphere; the tendency of this machine to rise, even without the application of artificial heat, would be near an ounce. Let its capacity be increased 16 times; and the tendency to arise will be equivalent to a pound, though this may be done without making the machine 16 times heavier than before. It is certain, however, that all aerostatic machines have a tendency to produce or preserve heat within them, which would by no means be imagined by those who have not made the experiment. When Messrs Charles and Roberts made their longest aerial voyage of 150 miles, they had the curiosity to try the temperature of the air within their balloon, in comparison with that of the external atmosphere; and at this time they found, that, when the external atmosphere was 63°, the thermometer within the balloon stood at 104°. Such a difference of temperature must have given a machine of the magnitude which carried them a considerable ascending power independent of any other cause, as it amounted to 41 grains on every cubic foot; and therefore in a machine containing 50,000 such feet would have been almost 200 pounds. Hence we may easily account for what happened at Dijon, and is recorded by Mr Morveau. "A balloon, intended to be filled with inflammable air, being completed, was, by way of trial, filled with common air, and in that state exposed to the atmosphere. Now it was observed, and indeed a similar observation had been made before, that the air within the balloon was much hotter than the circumambient air: the thermometer in the former stood at 120°; whereas in the latter, even when the sun shone upon it, the thermometer stood at 84°. This showed a considerable degree of rarefaction within the balloon; and consequently it was suspected, that, by means of this rarefaction alone, especially if it were to increase a little, the balloon might ascend. On the 30th of May, about noon, the wind being rather strong, agitated the balloon so that two men were employed to take care of it; but, notwithstanding all their endeavours, it escaped from its confinement, and, lifting up about 65 pounds weight of cords, equatorial circle, &c. rose many feet high, and, passing over some houses, went to the distance of 250 yards, where at length it was properly secured."

40 How balloons might rise by the common heat of the atmosphere.

41 A balloon at Dijon rises thus into the atmosphere.

42 Internal heat of the balloons has great influence on aerial voyages.

This difference between the external and internal heat being so very considerable, must have a great influence upon aerostatic machines, and will undoubtedly influence those filled with inflammable air as well as the other kind. Nor is it unlikely, that the short time which many aerial voyagers have been able to continue in the atmosphere, may have been owing to the want of a method of preserving this internal heat. It may naturally be supposed, and indeed it has always been found, that balloons, in passing through the higher regions of the atmosphere, acquire a very considerable quantity of moisture, not only from the rain or snow they sometimes meet with, but even from the dew and vapour which condenses upon them. On this an evaporation will instantly take place; and, as it is the property of this operation to produce a very violent cold, the internal heat of the balloon must be soon exhausted in such a manner as to make it become specifically heavier than the common atmosphere, and consequently descend in a much shorter time than it would have done by the mere loss of air. To this, in all probability, we are to ascribe the descent of the balloon which carried Messrs Blanchard and Jeffries; and which seemed so extraordinary to many people, that they were obliged to have recourse to an imaginary attraction in the waters of the ocean in order to solve the phenomenon. This supposition is rejected by Mr Cavallo; who explains the matter, by remarking, that in two former voyages made with the same machine, it could not long support two men in the atmosphere; so that we had no occasion to wonder at its weakness on this occasion. "As for its rising higher (says he), just when it got over the land, that may be easily accounted for. In the first place, the two travellers threw out their clothes just about that time; secondly, in consequence of the wind's then increasing, the balloon travelled at a much greater rate than it had done whilst over the sea; which increase of velocity lessened its tendency to descend: besides which, the vicissitudes of heat and cold may produce a very considerable effect; for if we suppose, that the air over the land was colder than that over the sea, the balloon coming into the latter from the former, continued to be hotter than the circumambient air for some time after; and consequently, it was comparatively much lighter when in the cold air over the land, than when in the hotter air over the sea; hence it floated easier in the former than in the latter case."

43 Great tendency of Mr Blanchard's balloon to descend accounted for.

It seems indeed very probable, that there was something uncommon in the case of Mr Blanchard's balloon while passing over the sea; for, as it rose higher after reaching the land than in any former period of the voyage, and likewise carried them to the distance over land more than half of that which they had passed over water, we can scarce avoid supposing, that it had a tendency to descend when over the water more than when over land, independent of any loss of air. Now, it does not appear that the air over the sea is at all warmer than that above land; on the contrary, there is every reason to believe, that the superior reflective power of the land renders the atmosphere above it warmer than the sea can do: but it is very natural to suppose, that the air above the sea is more moist than that above land; and consequently, by letting fall its moisture upon the balloon, must have occasioned an evaporation that would deprive the machine of its internal heat, which it would partly recover after it entered the warmer and drier atmosphere over land.

44 Construction of aerostatic machines.

We shall now proceed to the construction of aerostatic machines; of which the smaller are only for amusement, or some slight experiments, and are very easily made. As in all of them, however, it is of the utmost consequence to have the weight as little as possible, the shape becomes an object of great consideration,

45 Of their shape.

tion. For this purpose a spherical figure has been mathematically demonstrated to be the best; as capable of containing a greater quantity under a smaller surface than any other. Thus a perfect sphere contains less surface in proportion to its solidity than a spheroid; a spheroid less than a cylinder; the latter less than a cube; and a cube still less than a parallelopiped. In all cases, therefore, where we can fill the whole capacity of the balloon with air equally light, the spherical figure is undoubtedly to be preferred; and this holds good with regard to all inflammable air-balloons, whether their size be great or small; but in the rarefied air ones, where the under part must necessarily be much colder than the upper, the globular shape seems not so proper. An inverted cone, or truncated pyramid, with the smaller part undermost, seems then to be most proper, as it allows the heated air (which has a great tendency to expand as well as to ascend) to collect in the wide part at the top, while the useless surface in the lower part, and which, in any other figure, would contain only the colder and heavier air, is thus thrown aside. In fact it has been found, that aerostatic machines, raised by means of rarefied air, when made of the shape of a parallelopiped, or even one deviating still more from the shape of a globe, have answered the purpose as well as they could have been supposed to do, had ever so much care been taken in forming them exactly to that shape. The very first machine made by Mr Montgolfier was in form of a parallelopiped; and though it contained only 40 cubic feet, showed a very considerable power of ascent. A very large one, 74 feet high, which Mr Montgolfier had designed to exhibit before the royal family, had the middle part of it prismatic for about the height of 25 feet; its top was a pyramid of 29 feet; and its lower part was a truncated cone of near 20 feet. It weighed 1000 pounds; and, notwithstanding its shape, in a very short time manifested a power of ascent equal to 500 pounds. Another aerostatic machine of a small size, but of the figure of a parallelopiped, being suffered to ascend with 30 sheets of oiled paper fixed in a wire frame, and set on fire, rose to a great height, and in 22 minutes could not be seen. It seems therefore, that, with regard to the shape of these machines, it is by no means necessary to adhere rigidly to that of a sphere; but that any oblong form answers very well.

46 Materials.

For experimental purposes, both the inflammable and rarefied air-balloons may be made of paper; the former being made of that kind called *thin-post*, varnished over with linseed-oil; the latter either of that or any other kind, without varnish. In order to avoid the danger of burning, however, it has been proposed to impregnate the paper of which these small rarefied air-balloons are made with solution of sal-ammoniac, alum or some other salt; but this does not seem to be necessary. Those filled with inflammable air have been made of gold-beater skin or peeled bladders; but the cheaper material of paper is undoubtedly preferable.

47 Best varnish for inflammable-air balloons, according to Mr de St Fond.

For aerostatic machines of a larger size, the material universally employed is varnished silk; and for those of the rarefied-air kind, linen painted over with some size colour, or lined with paper. The best varnish for an inflammable air-balloon is that made with bird-lime, and recommended by Mr Faujas de Saint-Fond, in a treatise published on the subject. The following is his method of preparing it: "Take one pound of birdlime, put it into a new proper earthen pot that can resist the fire, and let it boil gently for about one hour, viz. till it ceases to crackle; or, which is the same thing, till it is so far boiled, as that a drop of it being let fall upon the fire will burn: then pour upon it a pound of spirits of turpentine, stirring it at the same time with a wooden spatula, and keeping the pot at a good distance from the flame, lest the vapour of this essential oil should take fire. After this, let it boil for about six minutes longer; then pour upon the whole three pounds of boiling oil of nuts, linseed, or poppy, rendered drying by means of litharge; stir it well, let it boil for a quarter of an hour longer, and the varnish is made. After it has rested for 24 hours, and the sediment has gone to the bottom, decant it into another pot; and when you want to use it, warm, and apply it with a flat brush upon the silk stuff, whilst that is kept well stretched. One coat of it may be sufficient; but if two are necessary, it will be proper to give one on each side of the silk, and to let them dry in the open air while the silk remains extended."

48 Mr Cavallo's method.

Mr Cavallo gives the following method of preparing this varnish, which he prefers to that of M. de St Fond.—"In order to render linseed-oil drying, boil it with two ounces of saccharum saturni and three ounces of litharge, for every pint of oil, till the oil has dissolved them, which will be accomplished in half an hour; then put a pound of birdlime and half a pint of the drying oil into a pot (iron or copper pots are the safest for this purpose), the capacity of which may be equal to about one gallon, and let it boil very gently over a slow charcoal fire till the birdlime ceases to crackle, which will be in about half or three quarters of an hour; then pour upon it two pints and a half more of drying oil, and let it boil for one hour longer, stirring it very frequently with an iron or wooden spatula. As the varnish, whilst boiling, and especially when it is nearly done, swells very much, care should be had to remove, in those cases, the pot from the fire, and to replace it when the varnish subsides, otherwise it will boil over. Whilst the stuff is boiling, the operator should, from time to time, examine whether the varnish has boiled enough; which is thus known:—Take some of it upon the blade of a knife, and then, after rubbing the blade of another knife upon it, separate the knives; and when, on this separation, the varnish begins to form threads between the two, you may conclude that it is done; and, without losing time, it must be removed from the fire. When it is almost, though not quite, cold, add about an equal quantity of spirit of turpentine: mix it well together, and let it rest till the next day; when, having warmed it a little, strain and bottle it. If it is too thick, add some more spirit of turpentine. When this varnish is laid upon the silk, the stuff should be made perfectly dry, and stretched; so that the varnish, which ought to be used lukewarm, may fill up the pores of the stuff. The varnish should be laid once very thin upon one side of the stuff; and, about 12 hours after, two other coats of it should be laid on, one on each side; and, 24 hours after, the silk may be used, though, in cold weather, it may be left to dry some time longer."

Much has been said in France of their elastic gum-varnish,

varnifh, and its compofition kept a fecret; but Mr Baldwin, after many expenfive trials, declares to the world what he confiders as the fecret; and it is merely this: "Take any quantity of caoutchouc, as two ounces averdupois; cut it into fmall bits with a pair of fciffars; put a ftrong iron ladle (like that ufed by plumbers) over a common pitcoal or other fire. The fire muft be gentle, glowing, and without fmoke. When the ladle is hot, much below a red heat, put a fingle bit into the ladle. If *black* fmoke iffues, it will prefently flame and difappear, or it will evaporate without flame: the ladle is then too hot. When the ladle is lefs hot, put in a fecond bit, which will produce a *white* fmoke. This *white* fmoke will continue during the operation, and evaporate the caoutchouc: therefore no time is to be loft; but little bits are to be put in, a few at a time, till the whole are melted. It fhould be continually and gently ftirred with an iron or brafs fpoon. Two pounds or one quart of the beft drying oil (or of raw linfeed-oil, which, together with a few drops of neats-foot oil, has ftood a month, or not fo long, on a lump of quicklime, to make it more or lefs drying), is to be put into the melted caoutchouc, and ftirred till hot, and the whole poured into a glazed veffel, through a coarfe gauze or fine fieve. When fettled and clear, which will be in a few minutes, it will be fit for ufe either hot or cold." Mr Baldwin is not at liberty, he obferves, to publifh the art of laying on the varnifh: but fays, that it confifts in making no *inteftine motion* in the varnifh, which would create minute bubbles; that therefore brufhes are improper. Mr Blanchard's method of making elafticgum varnifh for the filk of a balloon, is the following. "Diffolve elaftic gum (caoutchouc) cut fmall in five times its weight of fpirit of turpentine, by keeping them fome days together; then boil one ounce of this folution in eight ounces of drying linfeed-oil for a few minutes; laftly, ftrain it. It muft be ufed warm." The pieces of filk for the balloon muft be cut out of a proper fize, according to the dimenfions, after the varnifh is fufficiently dry. They may be joined by laying about half an inch of the edge of one piece over the edge of the other, and fewing them by a double ftitching. Mr Blanchard ufes expeditioufly the following method. He lays about half an inch of the edge of one piece flat over the edge of the other, and paffes a hot iron over it; in doing which a piece of paper ought to be laid both under and over the filk. The joining may be rendered more fecure by running it with a filk thread, and fticking a ribband over it. The ribbands laid over feams may be ftuck with common glue, provided the varnifh of the filk is properly dried. When the glue is quite dry, the ribbands fhould be varnifhed over, to prevent their being unglued by the rain.

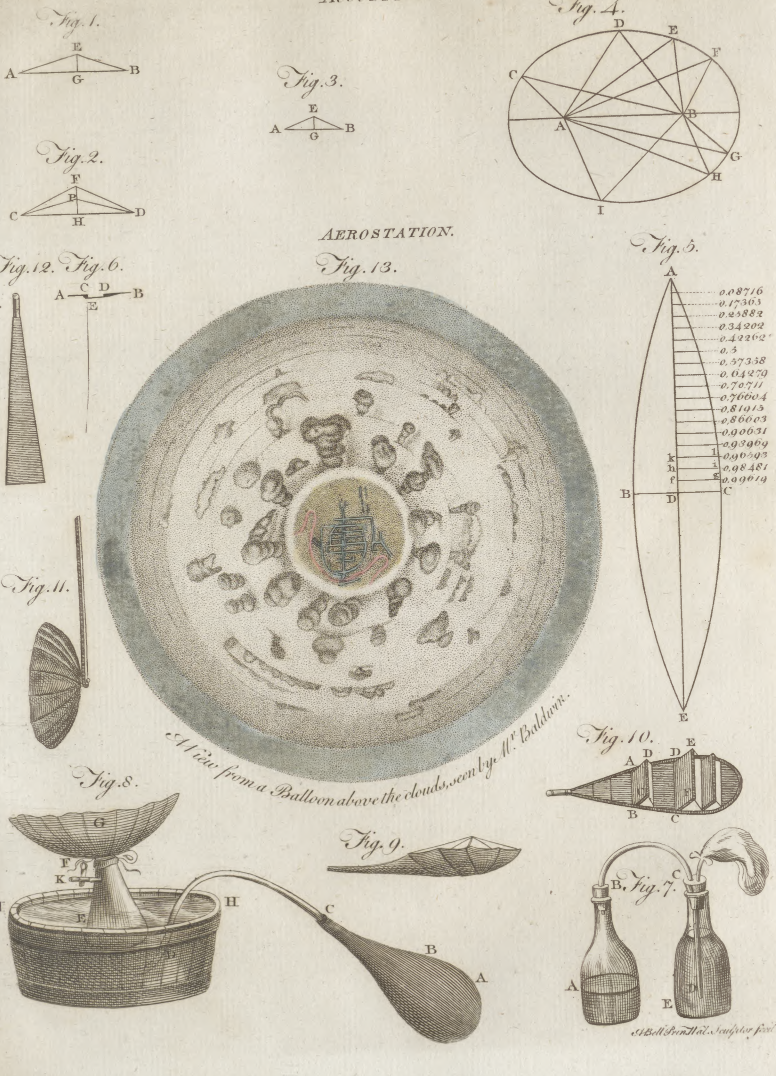
49 Of cutting the gores for a globe.

The beft method of cutting the pieces of filk that are to form a balloon, is to defcribe a pattern of wood or ftiff card-paper, and then to cut the filk upon it. As the edges of fuch a pattern are not perfect circles, they cannot be defcribed by a pair of compaffes: but the beft method of drawing them is as follows. Firft, draw, on a flat furface two right lines AE and BC, perpendicular to each other. Secondly, find the circumference anfwering to the given diameter of the balloon in feet and decimals of a foot; and make AD and DE each equal to a quarter of the circumference, fo that the whole length AE of the pattern may be equal to half the circumference. Thirdly, divide AD into 18 equal parts; and to the points of divifion apply the lines *fg*, *hi*, *kl*, &c. parallel to each other, and perpendicular to AD. Fourthly, divide the whole circumference in twice the given number of pieces, and make DC and BB each equal to the quotient of this divifion; fo that the whole, BC, is equal to the greateft breadth of one of thefe pieces. Fifthly, multiply the above-mentioned quotient by the decimals annexed to *fg*, viz. 0.99619, and then the product expreffes the length of *fg*; again multiply the fame length of DE by the decimals annexed to *hi*, and the product expreffes the length of *hi*; and, in fhort, the product arifing from the multiplication of the length of DC by the decimals annexed to each of the parallel lines, gives the length of that line. Laftly, having found the lengths of all thefe lines, draw by hand a curveline paffing through all the extremities of the faid lines, and that is the edge of one quarter of the pattern. The other quarters may be eafily defcribed, by applying to them a piece of paper cut according to that already found.—Suppofe, for example, that the diameter of the balloon to be conftructed is 20 feet, and that it is required to make it of 12 pieces: then, in order to draw the pattern for thofe pieces, find the circumference of the balloon, which is 62.83 feet, and, dividing it by four, the quotient is 15.7 feet; make therefore AD equal to 15.7 feet, and DE likewife of the fame length. Divide the circumference 62.83 by 24, which is double the number of pieces that are to form the balloon, and the quotient, 2.618 feet, is the length of DC and likewife of BD; fo that BC is equal to 5.236 feet. Then, having divided the line AD into 18 equal parts, and having drawn the parallel lines from thofe points of divifion, find the length of each of thofe lines by multiplying 2.618 by the decimals annexed to that line. Thus, 2.618, multiplied by 0.99619, gives 2.608 feet for the length of *fg*; and again, multiplying 2.618 by 0.98481, gives 2.578 feet for the length of *hi*; and fo of the reft.—In cutting the pieces after fuch a pattern, care fhould be taken to leave them about three quarters of an inch all round larger than the pattern, which will be taken up by the feams.

2d Plate II. fig. 5.

To the upper part of the balloon there fhould be adapted, and well fitted in, a valve opening inwards; to which fhould be faftened a ftring paffing through a hole made in a fmall piece of round wood fixed in the loweft part of the balloon oppofite to the valve, the end of this ftring faftened in the car below, fo that the aeronaut may open the valve when occafion requires. The action of this valve may be underftood from fig. 3. A round brafs plate AB has a round hole CD, about two or three inches diameter, covered on both fides with ftrong fmooth leather. On the infide there is a fhutter E, alfo of brafs, covered with leather, which is to clofe the hole CD; being about two inches larger in diameter than the hole. It is faftened to the leather of the plate AB; and by a fpring, which need not be very ftrong, it is kept againft the hole. The elafticity of the gas itfelf will help to keep it fhut. To this fhutter the ftring is faftened, by which it is occafionally opened for the efcape of gas. A fmall ftring

ACOUSTICS.



AEROSTATION.

A View from a Balloon above the clouds, seen by Mr. Baldwin.

A. Bell Prin. Wal. Sculptor fecit.

ftring or other fecurity fhould be fixed to the fhutter and the plate, fo as not to admit the fhutter to be opened beyond a certain fafe diftance. To the lower part of the balloon two pipes fhould be fixed, made of the fame ftuff as the envelope; 6 inches diameter for a balloon of 30 feet, and proportionally larger for balloons of a greater capacity. They muft be long enough for the car. For balloons of 18 feet and lefs diameter, one neck or pipe will be fufficient. Thefe pipes are the apertures through which the inflammable gas is introduced into the balloon.

The car or boat is beft made of wicker-work, covered with leather, and well painted or varnifhed over; and the proper method of fufpending it, is by ropes proceeding from the net which goes over the balloon. This net fhould be formed to the fhape of the balloon, and fall down to the middle of it, with various cords proceeding from it to the circumference of a circle about two feet below the balloon; and from that circle other ropes fhould go to the edge of the boat. This circle may be made of wood, or of feveral pieces of flender cane bound together. The mefhes of the net may be fmall at top, againft which part of the balloon the inflammable air exerts the greateft force; and increafe in fize as they recede from the top. A hoop has fometimes been applied round the middle of the balloon to faften the net. This, though not abfolutely neceffary, is beft made of pieces of cane bound together, and covered with leather.

With regard to the rarefied-air machines, Mr Cavallo recommends firft to foak the cloth in a folution of fal ammoniac and common fize, ufing one pound of each to every gallon of water; and when the cloth is quite dry, to paint it over in the infide with fome earthy colour, and ftrong fize or glue. When this paint has dried perfectly, it will then be proper to varnifh it with oily varnifh, which might dry before it could penetrate quite through the cloth. Simple drying linfeed oil will anfwer the purpofe as well as any, provided it be not very fluid.

50 Of filling aeroftatic machines.

It now only remains to give fome account of the method by which aeroftatic machines may be filled with their proper gas, in order to give them their power of afcending into the atmofphere; and here we are enabled to determine with much greater precifion concerning the inflammable-air balloons than the others.

51 Methods of procuring inflammable air..

With regard to them, a primary confideration is, the moft proper method of procuring the inflammable air. It may be obtained in various ways, as has been fhown under the article Aerology: But the moft advantageous methods are, by applying acids to certain metals; by expofing animal, vegetable, and fome mineral fubftances, in a clofe veffel to a ftrong fire; or by tranfmitting the vapour of certain fluids through red-hot tubes.

1. In the firft of thefe methods, iron, zinc, and vitriolic acid, are the materials moft generally ufed. The vitriolic acid muft be diluted by five or fix parts of water. Iron may be expected to yield in the common way 1700 times its own bulk of gas; or one cubic foot of inflammable air to be produced by $4\frac{1}{4}$ ounces of iron, the like weight of oil of vitriol, and $22\frac{1}{2}$ ounces of water. Six ounces of zinc, an equal weight of oil of vitriol, and 30 ounces of water, are neceffary for producing the fame quantity of gas. It is more proper to ufe the turnings or chippings of great pieces of iron, as of cannon, &c. than the filings of that metal, becaufe the heat attending the effervefcence will be diminifhed; and the diluted acid will pafs more readily through the interftices of the turnings when they are heaped together, than through the filings, which ftick clofer to one another. The weight of the inflammable air thus obtained by means of acid of vitriol, is, in the common way of procuring it, generally one feventh part of the weight of common air; but with the neceffary precautions for philofophical experiments, lefs than one-tenth of the weight of common air. Two other forts of elaftic fluids are fometimes generated with the inflammable air. Thefe may be feparated from it by paffing the inflammable air through water in which quicklime has been diffolved. The water will abforb thefe fluids, cool the inflammable air, and prevent its over-heating the balloon when introduced into it.

Fig. 7. of 2d Plate II. reprefents an apparatus defcribed by Mr Cavallo as proper for filling balloons of the fize of two or three feet in diameter with inflammable air, after paffing it through water.—A is the bottle with the ingredients; BCD a tube faftened in the neck at B, and paffing through C, the cork of the other bottle, in which there is another hole made to receive the tube on which the balloon is tied. Thus it is plain, that the inflammable air coming out of the tube D will pafs firft through the water of the bottle E and then into the balloon. Two fmall cafks may be ufed inftead of the bottles A and E.

2. Inflammable air may be obtained at a much cheaper rate by the action of fire on various fubftances; but the gas which thefe yield is not fo light as that produced by the effervefcence of acids and metals. The fubftances proper to be ufed in this way are, pit-coal, afphaltum, amber, rock-oil, and other minerals; wood, and efpecially oak, camphor-oil, fpirits of wine, ether, and animal fubftances, which yield air in different degrees, and of various fpecific gravities; but pit-coal is the preferable fubftance. A pound of this expofed to a red heat, yields about three cubic feet of inflammable air, which, whether it be paffed through water or not, weighs about one-fourth of the weight of common air. Dr Prieftley found, as we have elfewhere noticed, that animal or vegetable fubftances will yield fix or feven times more inflammable air when the fire is fuddenly increafed than when it is gently raifed, though it be afterwards made very ftrong. Mr Cavallo obferves, that the various fubftances above enumerated generally yield all their inflammable air in about one hour's time. The general method is, to inclofe the fubftances in iron or earthen veffels, and thus expofe them to a ftrong fire fufficient to make the veffels red-hot: the inflammable air proceeding from the aperture of the veffel is received into a tube or refrigeratory, and, paffing through the tube or worm, is at laft collected in a balloon or other veffel. A gun-barrel has often been ufed for effays of this kind. The fubftance is put into it fo as to fill fix or eight inches of its loweft part, the remainder filled with dry fand: a tube, adapted to the mouth of the barrel, is brought into a bafin of water under an inverted receiver; and the part of the barrel containing the fubftance being put into the fire and made red-hot, the inflammable air is collected

lected in the inverted receiver. As the gun-barrel cannot ſerve for producing a large quantity of inflammable air, Mr Cavallo recommends, as the moſt advantageous ſhape, the following contrivance:—Let the veſſel be made of clay, or rather of iron, in the ſhape of a Florence flaſk, ſomewhat larger, and whoſe neck is longer and larger (See ABC, fig. 8.) Put the ſubſtance to be uſed into this veſſel, ſo as to fill about four-fifths or leſs of its cavity AB. If the ſubſtance is of ſuch a nature as to ſwell much by the action of the fire, lute a tube of braſs, or firſt a braſs and then a leaden tube, to the neck C of the veſſel; and let the end D of the tube be ſhaped as in the figure, ſo that going into the [illegible]ter of a tube HI, it may terminate under a ſort of [illegible]erted veſſel EF, to the upper aperture of which the balloon G is adapted. Things thus prepared, if the part AB of the veſſel is put into the fire, and made red-hot, the inflammable air produced will come out of the tube CD, and paſſing through the water will at laſt enter into the balloon G. Previous to the operation, as a conſiderable quantity of common air remains in the inverted veſſel EF, which it is more proper to expel, the veſſel EF ſhould have a ſtop-cock K, through which the common air may be ſucked out, and the water aſcend as high as the ſtop-cock. The dimenſions of ſuch an apparatus Mr Cavallo gives thus: Diameter of largeſt part of the veſſel ABC ſeven inches, length of whole veſſel 16 inches; diameter of its aperture one inch, diameter of the cavity of tube CD three-fourths of an inch; lower aperture of the veſſel EF ſix inches, leaſt height of the veſſel EF 24 inches; its aperture F about two inches. The aperture of the veſſel EF ſhould be at leaſt one foot below the ſurface of the water in HI. Care muſt be taken that the fire uſed in this proceſs be at a ſufficient diſtance, otherwiſe it may happen to fire the inflammable air which may eſcape out of the veſſel EF.

3. The laſt method of obtaining inflammable air was lately diſcovered by Mr Lavoiſier, and alſo by Dr Prieſtley. Mr Lavoiſier made the ſteam of boiling water paſs through the barrel of a gun, kept red-hot by burning coals. Dr Prieſtley uſes, inſtead of the gun-barrel, a tube of red-hot braſs, upon which the ſteam of water has no effect, and which he fills with the pieces of iron which are ſeparated in the boring of cannon. By this method he obtains an inflammable air, the ſpecific gravity of which is to that of common air as 1 to 13. In this method, not yet indeed reduced to general practice, a tube, about three quarters of an inch in diameter, and about three feet long, is filled with iron turnings; then the neck of a retort, or cloſe boiler, is luted to one of its ends, and the worm of a refrigeratory is adapted to its other extremity. The middle part of the tube is then ſurrounded with burning coals, ſo as to keep about one foot in length of it red-hot, and a fire is always made under the retort or boiler ſufficient to make the water boil with vehemence. In this proceſs a conſiderable quantity of inflammable air comes out of the worm of the refrigeratory. It is ſaid that iron yields one half more air by this means than by the action of vitriolic acid.

For filling large balloons, a greater apparatus is neceſſary; and the only materials that can, with any certainty of ſucceſs, be employed for producing the proper gas, are, oil of vitriol, and iron filings or turnings.

It has indeed been recommended to uſe zinc inſtead of iron filings, becauſe white vitriol, the ſalt produced by the union of the vitriolic acid and zinc, is much more valuable than the green ſort produced by the union of the ſame acid with iron. But though this is undoubtedly the caſe, it will as certainly be found, upon trial, that the ſuperior price of the zinc will be more than an equivalent for all the advantage that can be derived from the additional price of the white vitriol.

52 Mr Cavallo's receipt.

For a balloon of 30 feet diameter, Mr Cavallo recommends 3900 pounds of iron turnings, as much oil of vitriol, and 19,500 pounds of water. Theſe proportions, however, appear too great with reſpect to the acid and metal, and too little with reſpect to the water. Oil of vitriol will not exert its power upon iron unleſs it be diluted with five or ſix times its quantity of water; in which caſe, a much ſmaller quantity of both acid and metal will ſerve.

53 Mr Lunardi's method.

Mr Lunardi, who from the number of his voyages had certainly much practical knowledge in aeroſtation, filled his balloon at Edinburgh and Glaſgow with about 2000 pounds of iron (the borings of cannon procured from Carron), as much vitriolic acid, and 12,000 pounds of water. The iron was placed in his veſſels in layers, with ſtraw between them, in order to increaſe the ſurface. His apparatus was not materially different from that of Mr Cavallo, repreſented bottom of Plate I. fig. 2. where AA are two tubs, about three feet in diameter and nearly two feet deep, inverted in large tubs BB filled with water. In the bottom of each of the inverted tubs a hole is made, and a tube E of tin adapted, which is about ſeven inches in diameter, and ſeven or eight long. To theſe tubes the ſilken ones of the balloon are to be tied. Round each of the tubs B, five, ſix, or more ſtrong caſks are placed; in the top of each two holes are made, and to one of theſe holes a tin tube is adapted, and ſo ſhaped, that, paſſing over the edge of the tub B, and through the water, it may terminate with its aperture under the inverted tub A. The other hole of theſe caſks ſerves for the introduction of materials, and is ſtopped with a wooden plug. When the balloon is to be filled, put the net over it, and let it be ſuſpended as ſhown by CDF; and having expelled all the common air from it, let the ſilken tubes be faſtened round the tin ones EE; and the materials being put into the caſks, the inflammable air, paſſing into the balloon, will ſoon diſtend, and render it capable of ſupporting itſelf; after which the rope GH may be ſlipped off. As the balloon continues to be filled, the net is adjuſted properly round it; the cords that ſurround it are faſtened to the hoop MN; then the boat IK being placed between the two ſets of caſks, is faſtened to the hoop MN, and every thing that is required to be ſent up, as ballaſt, inſtruments, &c. is placed in it. At laſt, when the balloon is little more than three quarters full, the ſilken tubes are ſeparated from the tin ones of the inverted tubs, and their extremities being tied up, are placed in the boat. Laſtly, the aeronauts being ſeated in the boat, the lateral ropes are ſlipped off, and the machine is abandoned to the air. (See *Blanchard's balloon*, Plate II.) This apparatus was at laſt reduced by Mr Lunardi to its utmoſt ſimplicity, by uſing only two large caſks, and ſuffering the vapour to go into the balloon without paſſing through water. Thus his balloon was filled in

in leſs than half an hour, when, before, it had required two hours at leaſt. The ſinking of his caſks in the ground was alſo an additional convenience, as it created no confuſion, and rendered the materials much more eaſily conveyed into them.

54 Of filling rarefied-air balloons.

With regard to the rarefied-air balloons, the method of filling them is as follows. A ſcaffold ABCD, the breadth of which is at leaſt two-thirds of the diameter of the machine, is elevated about ſix or eight feet above the ground. From the middle of it deſcends a well E, riſing about two or three feet above it, and reaching to the ground, furniſhed with a door or two, through which the fire in the well is ſupplied with fuel. The well ſhould be conſtructed of brick or of plaſtered wood, and its diameter ſhould be ſomewhat leſs than that of the machine. On each ſide of the ſcaffold are erected two maſts HI, KL, each of which has a pulley at the top, and rendered firm by means of ropes KG, KP, HP, HG. The machine to be filled is to be placed on the ſcaffold, with its neck round the aperture of the well. The rope paſſing over the pullies of the two maſts, ſerves, by pulling its two ends, to lift the balloon about 15 feet or more above the ſcaffold; and the reſt of the machine is repreſented by the dotted lines in the figure MNO. The machine is kept ſteady, and held down, whilſt filling, by ropes paſſing through loops or holes about its equator; and theſe ropes may eaſily be diſengaged from the machine, by ſlipping them through the loops when it is able to ſuſtain itſelf. The proper combuſtibles to be lighted in the well, are thoſe which burn quick and clear, rather than ſuch as produce much ſmoke; becauſe it is hot air, and not ſmoke, that is required to be introduced into the machine. Small wood and ſtraw have been found to be very fit for this purpoſe. Mr Cavallo obſerves, as the reſult of many experiments with ſmall machines, that ſpirits of wine are upon the whole the beſt combuſtible; but its price may prevent its being uſed for large machines. As the current of hot air aſcends, the machine will ſoon dilate, and lift itſelf above the ſcaffold and gallery which was covered by it. The paſſengers, fuel, inſtruments, &c. are then placed in the gallery. When the machine makes efforts to aſcend, its aperture muſt be brought, by means of the ropes annexed to it, towards the ſide of the well a little above the ſcaffold; the fireplace is then ſuſpended in it, the fire lighted in the grate, and the lateral ropes being ſlipped off the machine is abandoned to the air. (See *Montgolfier's balloon*, Plate II.) It has been determined by accurate experiments, that only one-third of the common air can be expelled from theſe large machines; and therefore the aſcending power of the rarefied air in them can be eſtimated as only equal to half an ounce averdupoiſe for every cubic foot.

The conduct of balloons, when conſtructed, filled, and actually aſcending in the atmoſphere, is an object of great importance in the practice of aeroſtation. The method generally uſed for elevating or lowering the balloons with rarefied air, has been the increaſe or diminution of the fire; and this is entirely at the command of the aeronaut, as long as he has any fuel in the gallery. The inflammable-air balloons have been generally raiſed or lowered by diminiſhing the weight in the boat, or by letting out ſome of the gas through the valve: but the alternate eſcape of the air in deſcending, and diſcharge of the ballaſt for aſcending, will by degrees render the machine incapable of floating; for in the air it is impoſſible to ſupply the loſs of ballaſt, and very difficult to ſupply that of inflammable air. Theſe balloons will alſo riſe or fall by means of the rarefaction or condenſation of the incloſed air, occaſioned by heat and cold. It has been propoſed to aid a balloon in its alternate motion of aſcent and deſcent, by annexing to it a veſſel of common air, which might be condenſed for lowering the machine, and rarefied again, by expelling part of it, for raiſing the machine: But a veſſel adapted to this purpoſe muſt be very ſtrong; and, after all, the aſſiſtance afforded by it would not be very conſiderable. M. Meunier, in order to attain this end, propoſes to incloſe one balloon filled with common air in another filled with inflammable air: as the balloon aſcends, the inflammable air is dilated, and of courſe compreſſes the internal balloon containing the common air; and by diminiſhing its quantity, leſſens its weight. If it ſhould be neceſſary to ſupply this loſs, he ſays it may be eaſily done by a pair of bellows fixed in the gallery. Others have propoſed to annex a ſmall machine with rarefied air to an inflammable-air balloon by ropes, at ſuch a diſtance that the fire of the former might not affect the inflammable air of the latter: the whole apparatus, thus combined, of balloons formed on the two principles of heated and inflammable air, might be raiſed or lowered by merely increaſing or diminiſhing the fire in the lower balloon.

Wings or oars are the only means of this ſort that have been uſed with ſome ſucceſs; and, as Mr Cavallo obſerves, they ſeem to be capable of conſiderable improvement. Although great effects are not to be expected from them, when the machine goes at a great rate, the beſt methods of moving thoſe wings are by the human ſtrength applied ſimilarly to the oars of a waterman. They may be made in general of ſilk ſtretched between wires, tubes, or ſticks; and when uſed, muſt be turned edgewiſe when they are moved in the direction in which the machine is intended to be impelled, but flat in the oppoſite direction. Fig. 9. 2d Plate II. is the repreſentation of one of Mr Blanchard's wings. Fig. 10. is one of thoſe uſed by Mr Lunardi, which conſiſts of many ſilk ſhutters or valves, ABCD, DECF, &c. every one of which opens on one ſide only, viz. ADBC opens upon the line AB, DECF opens upon the line DC, &c. In conſequence of this conſtruction, this ſort of oars do not need being turned edgewiſe. Fig. 11. repreſents one of the wings uſed by the brothers Roberts in the aerial voyage of the 19th September 1784; and fig. 12. repreſents one of the wings conſtructed by Count Zambeccari, which conſiſts of a piece of ſilk ſtretched between two tin tubes ſet at an angle; but theſe wings are ſo contrived as to turn edgewiſe by themſelves when they go on one direction. Other contrivances have been made to direct aeroſtatic machines, but they have moſtly been invented to effect a power upon them as upon a ſhip. It appears, however, that they can have no effect when a machine is only moved by the wind alone, becauſe the circumambient air is at reſt in reſpect to the machine. The caſe is quite different with a veſſel at ſea, becauſe the water on which it floats ſtands ſtill whilſt the veſſel goes on; but it muſt be time and experience that can realize the expectations ſuggeſted by theſe contrivances.

AERSHOT, a town in the Netherlands, in the duchy of Brabant, and capital of the duchy of Aerſhot. It is ſeated on the river Demur, ten miles eaſt of Malines or Mechlin, and eight north of Louvain. E. Long. 5. 4. N. Lat. 51. 15.

ÆRUGINOUS, an epithet given to ſuch things as reſemble or partake of the nature of the ruſt of copper.

ÆRUGO, in natural hiſtory, properly ſignifies the ruſt of copper, whether natural or artificial. The former is found about copper mines, and the latter, called *verdegris*, made by corroding copper-plates with acids. See *Verdegris*.

ÆRUSCATORES, in antiquity, a kind of ſtrolling beggars, not unlike gypſies, who drew money from the credulous by fortune-telling, &c. It was alſo a denomination given to griping exactors, or collectors of the revenue. The Galli, or prieſts of Cybele, were called *æruſcatores magnæ matris;* and μητραγυρται, on account of their begging or collecting alms in the ſtreets; to which end they had little bells whereby to draw peoples attention to them, much like ſome orders of mendicants abroad.

AERY, or AIRY, among ſportſment. See AIRY.

ÆS UXORIUM, in antiquity, a ſum paid by bachelors, as a penalty for living ſingle to old age. This tax for not marrying ſeems to have been firſt impoſed in the year of Rome 350, under the cenſorſhip of M. Furius Camillus and M. Poſthumus. At the cenſus, or review of the people, each perſon was aſked, *Et tu ex anima ſententia uxorem habes liberum quærendorum cauſa?* He who had no wife was hereupon fined after a certain rate, called *æs uxorium.*

Æs per et libram was a formula in the Roman law, whereby purchaſes and ſales are ratified. Originally the phraſe ſeems to have been only uſed in ſpeaking of things ſold by weight, or by the ſcales; but it afterwards was uſed on other occaſions. Hence even in adoptions, as there was a kind of imaginary purchaſe; the formula whereof expreſſed, that the perſon adopted was bought *per æs et libram.*

Æs Flavum, yellow copper, among the Romans, an appellation given to the coarſer kinds of braſs.

Æs Caldarium, a term uſed by the German mineraliſts, for a ſubſtance which ſometimes occurs to thoſe who work upon cobalt, and is uſed for the making the fine blue colour called *ſmalt.*

Æs Uſtum, a chemical preparation, made of thin leaves of copper, ſulphur, and nitre, placed *ſtratum ſuper ſtratum* in a crucible, and ſet in a charcoal fire till all the ſulphur is conſumed; after which, the copper is taken out of the crucible, and reduced to powder. Some quench the leaves of copper in vinegar, and repeat the calcination.—Its principal uſe is in colouring glaſs, to which it gives a beautiful tincture. The ſurgeons uſe it as a deterſive, and ſome have given it internally; but it is certainly a very dangerous medicine, and ſhould be avoided.

ÆSCHINES, a Socratic philoſopher, the ſon of Charinus a ſauſage-maker. He was continually with Socrates; which occaſioned this philoſopher to ſay, that the ſauſage-maker's ſon was the only perſon who knew how to pay a due regard to him. It is ſaid that poverty obliged him to go to Sicily to Dionyſius the Tyrant; and that he met with great contempt from Plato, but was extremely well received by Ariſtippus; to whom he ſhowed ſome of his dialogues, and received from him a handſome reward. He would not venture to profeſs philoſophy at Athens, Plato and Ariſtippus being in ſuch high eſteem; but he ſet up a ſchool to maintain himſelf. He afterwards wrote orations for the Forum. Phrynicus, in Photius, ranks him amongſt the beſt orators, and mentions his orations as the ſtandard of the pure Attic ſtyle. Hermogenes has alſo ſpoken very highly of him.—He alſo wrote ſeveral dialogues, of which there are only three extant: 1. Concerning Virtue, whether it can be taught. 2. Eryxias, or Eraſiſtratus; concerning riches, whether they are good. 3. Axiochus; concerning death, whether it is to be feared. Mr Le Clerc has given a Latin tranſlation of them, with notes, and ſeveral diſſertations intitled *Sylvæ Philologicæ.*

ÆSCHYLUS, the tragic poet, was born at Athens. Authors differ in regard to the time of his birth, ſome placing it in the 65th, others in the 70th Olympiad; but according to Stanley, who relies on the Arundelian marbles, he was born in the 63d Olympiad. He was the ſon of Euphorion, and brother to Cynegirus and Aminias, who diſtinguiſhed themſelves in the battle of Marathon, and the ſea-fight of Salamis, at which engagements Æſchylus was likewiſe preſent. In this laſt action, according to Diodorus Siculus, Aminias, the younger of the three brothers, commanded a ſquadron of ſhips, and behaved with ſo much conduct and bravery, that he ſunk the admiral of the Perſian fleet, and ſignalized himſelf above all the Athenians. To this brother our poet was, upon a particular occaſion, obliged for ſaving his life: Ælian relates, that Æſchylus being charged by the Athenians with certain blaſphemous expreſſions in ſome of his pieces, was accuſed of impiety, and condemned to be ſtoned to death: they were juſt going to put the ſentence in execution, when Aminias, with a happy preſence of mind, throwing aſide his cloak, ſhowed his arm without a hand, which he had loſt at the battle of Salamis in defence of his country. This ſight made ſuch an impreſſion on the judges, that, touched with the remembrance of his valour, and with the friendſhip he ſhowed for his brother, they pardoned Æſchylus. Our poet, however, reſented the indignity of this proſecution, and reſolved to leave a place where his life had been in danger. He became more determined in this reſolution when he found his pieces leſs pleaſing to the Athenians than thoſe of Sophocles, tho' a much younger writer. Some affirm, that Æſchylus never ſat down to compoſe but when he had drank liberally. He wrote a great number of tragedies, of which there are but ſeven remaining: and notwithſtanding the ſharp cenſures of ſome critics, he muſt be allowed to have been the father of the tragic art. In the time of Theſpis, there was no public theatre to act upon; the ſtrollers driving about from place to place in a cart. Æſchylus furniſhed his actors with maſks, and dreſſed them ſuitably to their characters. He likewiſe introduced the buſkin, to make them appear more like heroes.—The ancients gave Æſchylus alſo the praiſe of having been the firſt who removed murders and ſhocking ſights from the eyes of the ſpectators. He is ſaid likewiſe to have leſſened the number of the chorus. M. Le Fevre has obſerved, that Æſchylus never repreſented women in love in his tragedies; which, he ſays, was not ſuited to his genius; but, in repreſenting a woman tranſported with fury, he was incomparable. Longius ſays, that

Æschynomene. Æschylus has a noble boldneſs of expreſſion; and that his imagination is lofty and heroic. It muſt be owned, however, that he affected pompous words, and that his ſenſe is too often obſcured by figures: this gave Salmaſius occaſion to ſay, that he was more difficult to be underſtood than the ſcripture itſelf. But notwithſtanding theſe imperfections, this poet was held in great veneration by the Athenians, who made a public decree that his tragedies ſhould be played after his death. He was killed in the 69th year of his age, by an eagle letting fall a tortoiſe upon his head as he was walking in the fields. He had the honour of a pompous funeral from the Sicilians, who buried him near the river Gela; and the tragedians of the country performed plays and theatrical exerciſes at his tomb.—The beſt edition of his plays is that of London, 1663, fol. with a Latin tranſlation and a learned commentary by Thomas Stanly.

ÆSCHYNOMENE, Bastard sensitive-plant: A genus of the decandria order, belonging to the diadelphia claſs of plants; the characters of which are: The *calyx* is a one-leav'd campanulated bilabiated perianthium; the lips equal, but the ſuperior one two-cleft, the inferior tridentate. The *corolla* is papillionaceous; the banner cordated and ſubringent; the *alæ* ovate, obtuſe, and ſhorter than the banner; and the carina lunated, pointed, and the length of the alæ. The *ſtamina* conſiſt of 10 ſimple 9-cleft filaments; the antheræ ſmall. The *piſtillum* is an oblong villous columnar germen; the ſtylus ſubulated and aſcending, the ſtigma ſimple and ſomewhat obtuſe. The pericarpium is a long compreſſed, unilocular jointed pod. The *ſeeds* are kidney-ſhaped, and ſolitary within each joint. Of this genus they are reckoned ſix

Species. 1. The aſpera (as well as the reſt of this genus) is a native of warm countries. It riſes to the height of four or five feet, having a ſingle herbaceous ſtalk, which is rough in ſome parts. The leaves come out on every ſide towards the top, forming a ſort of head; the flowers come out between the leaves, two or three together upon long footſtalks; they are yellow, and ſhaped like thoſe of peas: after the flower is paſt, the germen becomes a flat jointed pod, which, when ripe, parts at the joints, and in each diviſion is lodged a ſingle kidney-ſhaped ſeed. 2. The Americana, ſeldom riſes more than two feet in height. The flowers come out from the leaves on branching footſtalks, five or ſix together; theſe are much leſs than the former, and of a paler yellow colour. The ſeed is lodged in pods like the other. 3. The arborea, grows to the height of ſix or ſeven feet, with a ſingle ſtem; the flowers come out two or three together, of a copper colour, and as large as thoſe of the aſpera. 4. The ſeſban hath woody ſtems, and branches garniſhed with ſmooth leaves. The flowers are ſmall, of a deep yellow colour, and come out on long ſpikes hanging downward. The ſeed is contained in a ſmooth pod not jointed. 5. The pumila, riſes to the height of about three feet; has flowers of a pale yellow colour, which come out ſometimes ſingle, at other times two or three upon each footſtalk. The ſeeds are contained in a long falcated pod having 13 or 14 diviſions, each of which lodges a ſingle ſeed. 6. The grandiflora, riſes ſix or eight feet high, with a woody ſtem, ſending out branches towards the top, garniſhed with obtuſe leaves. The flowers are large, yellow, and ſucceeded by large pods containing kidney-ſhaped ſeeds. Æſculapius.

Culture. Theſe plants are propagated by ſeeds, which ſhould be ſown early in the ſpring, on a hot-bed; and when the plants have ſtrength enough to be removed, they ſhould each be put into a ſeparate pot filled with light earth, and plunged into a hot-bed. As they increaſe in ſize, they muſt be removed into larger pots; but if theſe are too large, the plants will not thrive. They muſt be brought forward early in the year, otherwiſe the ſecond kind will not perfect its ſeed.

ÆSCULAPIUS, in the Heathen mythology, the god of phyſic, was the ſon of Apollo and the nymph Coronis. He was educated by the centaur Chiron, who taught him phyſic; by which means Æſculapius cured the moſt deſperate diſeaſes. But Jupiter, enraged at his reſtoring to life Hippolitus, who had been torn in pieces by his own horſes, killed him with a thunderbolt. According to Cicero, there were three deities of this name: the firſt, the ſon of Apollo, worſhipped in Arcadia, who invented the probe, and bandages for wounds; the ſecond, the brother of Mercury, killed by lightning; and the third, the ſon of Ariſippus and Arſinoe, who firſt taught the art of tooth-drawing and purging. At Epidaurus, Æſculapius's ſtatue was of gold and ivory, with a long beard, his head ſurrounded with rays, holding in one hand a knotty ſtick, and the other entwined with a ſerpent; he was ſeated on a throne of the ſame materials as his ſtatue, and had a dog lying at his feet. The Romans crowned him with laurel, to repreſent his deſcent from Apollo; and the Phaliaſins repreſented him as beardleſs. The cock, the raven, and the goat, were ſacred to this deity. His chief temples were at Pergamus, Smyrna, Trica a city in Ionia, and the iſle of Coos; in all which, votive tablets were hung up, ſhowing the diſeaſes cured by his aſſiſtance. But his moſt famous ſhrine was at Epidaurus; where, every five years, games were inſtituted to him, nine days after the Iſthmian games at Corinth.

ÆSCULUS, the Horse-chestnut: A genus of the monogynia order, belonging to the heptandria claſs of plants; and ranking, in the natural method, under the 39th order, *Trihilatæ*.—The characters are: The *calyx* is a ſmall, ſingle-leaved, bellied perianthium, divided into five ſegments. The *corolla* (except in the *pavia*, where it is four-petal'd and cloſe) conſiſts of five roundiſh, flat, expanding petals, unequally coloured, and with narrow claws inſerted into the calyx. The *ſtamina* have ſeven ſubulated declining filaments, the length of the corolla; the antheræ aſcending. The *piſtillum* is a roundiſh germen, ending in a ſubulated ſtylus; the ſtigma pointed. The *pericarpium* is a leathery, roundiſh, trilocular, three-valved capſule. The *ſeeds* are two, and ſubglobular.—In this genus Van Rozen and Miller obſerve both male and hermaphrodite flowers. There are two

Species. 1. The hippocaſtanum, or common horſe-cheſtnut. It was brought from the northern parts of Aſia about the year 1550, and ſent to Vienna about 1588. This tree makes a noble appearance all the month of May, the extremities of the branches being terminated by fine ſpikes of flowers ſpotted with roſe colours, ſo that the whole tree ſeems covered with them. It is quick in its growth; ſo that in a few years it arrives at a ſize large enough to afford a good ſhade in ſummer,

ſummer, as alſo to produce plenty of flowers. They have, however, this great inconvenience, that their wood is of no uſe, being unfit even for burning; and their leaves beginning to fall in July, ſoon deprive the trees of their beauty. There is ſomething very ſingular in the growth of theſe trees; which is, that the whole ſhoot is performed in leſs than three weeks after the buds are opened.—The nuts are reckoned good food for horſes. In Turkey, they are ground, and mixed with the provender of theſe animals, eſpecially thoſe which are troubled with coughs or broken-winded. Deer are alſo very fond of the fruit; and at the time of their ripening keep much about the trees, but eſpecially in ſtrong winds, when the nuts are blown down, which they carefully watch, and greedily devour as they fall.

2. The pavia, or ſcarlet-flowering horſe-cheſtnut, a native of Carolina, the Braſils, and the Eaſt. It grows to about fifteen or ſixteen feet high; and there is a delicacy in this tree that makes it deſirable. The bark of the young ſhoots is quite ſmooth, and the growing ſhoots in ſummer are of a reddiſh hue. The leaves are palmated, being pretty much like thoſe of the horſe-cheſnut, only much ſmaller, and the indentures at the edges are deeper and more acute. The lobes of which they are compoſed are ſpear-ſhaped; they are five in number, are united at their baſe, and ſtand on a long red footſtalk. The leaves grow oppoſite by pairs on the branches, which are ſpread abroad on every ſide. The flowers come out from the ends of the branches. The firſt appearance of the buds is in May; though they will not be in full blow till the middle of June. They are of a bright red colour, and conſequently have a pleaſing effect among the vaſt tribe of yellow-flowering ſorts which ſhow themſelves in bloom at that ſeaſon. They continue in ſucceſſion for upwards of ſix weeks; and ſometimes are ſucceeded by ripe ſeeds in our gardens.

Propagation and culture. The firſt ſpecies is propagated from the nuts. In autumn, therefore, when they fall, a ſufficient quantity ſhould be gathered. Theſe ſhould be ſown ſoon afterwards in drills, about two inches aſunder. If the nuts are kept till ſpring, many of them will be faulty; but where the ſeminary-ground cannot be got ready before, and they are kept ſo long, it may be proper to put them in water, to try their goodneſs. The good nuts will ſink, whilſt thoſe which are faulty will ſwim; ſo that by proving them this way you may be ſure of good nuts, and have more promiſing hopes of a crop. In the ſpring the plants will come up; and when they have ſtood one year, they may be taken up, their tap-roots ſhortened, and afterwards planted in the nurſery. When they are of ſufficient ſize to be planted out finally, they muſt be taken out of the nurſery with care, the great ſide-ſhoots and the bruiſed parts of the roots ſhould be taken off, and then planted in large holes level with the ſurface of the ground, at the top of their roots; the fibres being all ſpread and lapped in the fine mold, and the turf alſo worked to the bottom. A ſtake ſhould be placed to keep them ſafe from the winds; and they muſt be fenced from the cattle till they are of a ſufficient ſize to defend themſelves. The beſt ſeaſon for all this work is October. After the trees are planted, neither knife nor hatchet ſhould come near them; but they ſhould be left to Nature to form their beautiful parabolic heads, and aſſume their utmoſt beauty.—The horſe-cheſnut, like moſt other trees, delights moſt in good fat land; but it will grow exceedingly well on clayey and marley grounds.

Miller ſays, "When theſe trees are tranſplanted, their roots ſhould be preſerved as entire as poſſible, for they do not ſucceed well when torn or cut: nor ſhould any of the branches be ſhortened, for there is ſcarce any tree that will not bear amputation better than this; ſo that when any branches are by accident broken, they ſhould be cut off cloſe to the ſtem, that the wound may heal over."

The ſecond ſpecies is propagated, 1. By budding it upon the young plants of the horſe-cheſnut. Theſe ſtocks ſhould be raiſed as was directed in that article. They ſhould be planted in the nurſery way, one foot aſunder, and two feet diſtant in the rows, which ſhould be kept clean of weeds, and muſt be dug between every winter till the operation is to be performed. After they have ſtood in the nurſery-ground about two years, and have made at leaſt one good ſummer's ſhoot, the ſummer following is the time for the operation. Then, having your cuttings ready ſoon after midſummer, the evenings and cloudy weather ſhould be made choice of for the work. Whoever has a great number of trees to inoculate, muſt regard no weather, but keep working on, to get his buſineſs over before the ſeaſon ends; and, indeed, a good hand will be always pretty ſure of ſucceſs be the weather what it will. If the ſtocks were healthy, the ſummer following they will make pretty good ſhoots; and in a year or two after that will flower. This is one method of propagating this tree; and thoſe plants that are propagated this way will grow to a larger ſize than thoſe raiſed immediately from ſeeds.—2. This tree alſo may be propagated by ſeeds; which will ſometimes ripen with us, and may be obtained out of our own gardens. The manner of raiſing them this way is as follows: Let a warm border be prepared; and if it is not naturally ſandy, let drift-ſand be mixed with the ſoil; and in this border let the ſeeds be ſown in the month of March, about half an inch deep. After this, conſtant weeding muſt be obſerved; and when the plants are come up, if they could be ſhaded in the heat of the day, it would be much better. Theſe, with now and then a gentle watering in a dry ſeaſon, will be all the precautions they will require the firſt ſummer. The winter following, if the ſituation is not extremely well ſheltered, protection muſt be given them from the hard black froſts, which will otherwiſe often deſtroy them; ſo that it will be the ſafeſt way to have the bed hooped, to cover them with mats in ſuch weather, if the ſituation is not well defended: if it is, this trouble may be ſaved; for, even when young, they are tolerably hardy. In about two or three years they may be removed into the nurſery, or planted where they are to remain, and they will flower in three or four years after. The uſual nurſery-care muſt be taken of them when planted in that way; and the beſt time for planting them there, or where they are to remain, is October; though they will grow exceeding well if removed in any of the winter months; but, if planted late in the ſpring, they will require more watering, as the ground will not be ſo regularly ſettled

ſettled to the roots as if they had been planted earlier.

ÆSOP, the Phrygian, lived in the time of Solon, about the 50th Olympiad, under the reign of Crœſus the laſt king of Lydia. As to genius and abilities, he was greatly indebted to nature; but in other reſpects not ſo fortunate, being born a ſlave and extremely deformed. St Jerom, ſpeaking of him, ſays he was unfortunate in his birth, condition in life, and death; hinting thereby at his deformity, ſervile ſtate, and tragical end. His great genius, however, enabled him to ſupport his misfortunes; and in order to alleviate the hardſhips of ſervitude, he compoſed thoſe entertaining and inſtructive fables which have acquired him ſo much reputation. He is generally ſuppoſed to have been the inventor of that kind of writing; but this is conteſted by ſeveral, particularly Quintilian, who ſeems to think that Heſiod was the firſt author of fables. Æſop, however, certainly improved this art to a very great degree; and hence it is that he has been accounted the author of this ſort of productions:

> Æſopus auctor quam materiam reperit,
> Hanc ego polivi verſibus ſenariis.
> *Phæd.* Prol. ad. lib. i.
> If any thoughts in theſe iambics ſhine,
> Th' invention's Æſop's, and the verſe is mine."

The firſt maſter whom Æſop ſerved, was one Caraſius Demarchus, an inhabitant of Athens; and there in all probability he acquired his purity in the Greek tongue. After him he had ſeveral maſters; and at length came under a philoſopher named Idmon or Iadmon, who enfranchiſed him. After he had recovered his liberty, he ſoon acquired a great reputation amongſt the Greeks; ſo that, according to Meziriac, the report of his wiſdom having reached Crœſus, he ſent to inquire after him, and engaged him in his ſervice. He travelled through Greece, according to the ſame author; whether for his own pleaſure, or upon the affairs of Crœſus, is uncertain; and paſſing by Athens ſoon after Piſiſtratus had uſurped the ſovereign power, and finding that the Athenians bore the yoke very impatiently, he told them the fable of the frogs who petitioned Jupiter for a king. The images made uſe of by Æſop are certainly very happy inventions to inſtruct mankind; they poſſeſs all that is neceſſary to perfect a precept, having a mixture of the uſeful with the agreeable. "Æſop the fabuliſt (ſays Aulus Gellius) was deſervedly eſteemed wiſe, ſince he did not, after the manner of the philoſophers, rigidly and imperiouſly dictate ſuch things as were proper to be adviſed and perſuaded; but, framing entertaining and agreeable apologues, he thereby charms and captivates the human mind."—Æſop was put to death at Delphi. Plutarch tells us, that he came there with a great quantity of gold and ſilver, being ordered by Crœſus to offer a ſacrifice to Apollo, and to give a conſiderable ſum to each inhabitant: but a quarrel ariſing betwixt him and the Delphians, he ſent back the money to Crœſus; for he thought thoſe for whom the prince deſigned it, had rendered themſelves unworthy of it. The inhabitants of Delphi contrived an accuſation of ſacrilege againſt him; and pretending they had convicted him, threw him headlong from a rock. For this cruelty and injuſtice, we are told they were viſited with famine and peſtilence; and conſulting the oracle, they received for anſwer, that the god deſigned this as a puniſhment for their treatment of Æſop: they endeavoured to make an atonement, by raiſing a pyramid to his honour.

ÆSOP (Clodius), a celebrated actor, who flouriſhed about the 670th year of Rome. He and Roſcius were cotemporaries, and the beſt performers who ever appeared upon the Roman ſtage, the former excelling in tragedy, the latter in comedy. Cicero put himſelf under their direction to perfect his action. Æſop lived in a moſt expenſive manner, and at one entertainment is ſaid to have had a diſh which coſt above eight hundred pounds; this diſh, we are told, was filled with ſinging and ſpeaking birds, ſome of which coſt near 50*l*. The delight which Æſop took in this ſort of birds proceeded, as Mr Bayle obſerves, from the expence. He did not make a diſh of them becauſe they could ſpeak, according to the refinement of Pliny upon this circumſtance, this motive being only by accident; but becauſe of their extraordinary price. If there had been any birds that could not ſpeak, and yet more ſcarce and dear than theſe, he would have procured ſuch for his table. Æſop's ſon was no leſs luxurious than his father, for he diſſolved pearls for his gueſts to ſwallow. Some ſpeak of this as a common practice of his; but others mention his falling into this exceſs only on a particular day, when he was treating his friends. Horace* ſpeaks only of one pearl of great value, which he diſſolved in vinegar, and drank. Æſop, notwithſtanding his expences, is ſaid to have died worth above 160,000*l*. When he was upon the ſtage, he entered into his part to ſuch a degree, as ſometimes to be ſeized with a perfect ecſtaſy. Plutarch mentions it as reported of him, that whilſt he was repreſenting Atreus deliberating how he ſhould revenge himſelf on Thyeſtes, he was ſo tranſported beyond himſelf in the heat of action, that with his truncheon he ſmote one of the ſervants croſſing the ſtage, and laid him dead on the ſpot.

* Sat. ii. lib. ii. 239.

ÆSTIMATIO CAPITIS, a term met with in old law-books for a fine anciently ordained to be paid for offences committed againſt perſons of quality, according to their ſeveral degrees.

ÆSTIVAL, in a general ſenſe, denotes ſomething connected with, or belonging to, ſummer. Hence æſtival ſign, æſtival ſolſtice, &c.

ÆSTUARIA, in geography, denotes an arm of the ſea, which runs a good way within land. Such is the Briſtol channel, and many of the friths of Scotland.

ÆSTUARIES, in ancient baths, were ſecret paſſages from the hypocauſtum into the chambers.

ÆSTUARY, among phyſicians, a vapour-bath, or any other inſtrument for conveying heat to the body.

ÆSYMNIUM, in antiquity, a monument erected to the memory of the heroes, by Æſymnus the Megarean. He conſulting the oracle in what manner the Megareans might be moſt happily governed, was anſwered, *If they held conſultation with the more numerous:* whom he taking for the dead, built the ſaid monument, and a ſenate-houſe that took within its compaſs the monument; imagining, that thus the dead would aſſiſt at their conſultations. (Pauſanias.)

ÆETH, or ATH, a ſtrong little town in the Auſtrian Netherlands and province of Hainault, ſituated on the river Dender, about twenty miles S. W. of Bruſſels.

ÆTHALIA, or ILUA (anc. geog.) now *Elba;* an

Æthelſtan, Æther.

iſland on the coaſt of Etruria, in compaſs an hundred miles, abounding in iron, as Elba ſtill does. Stephanus calls it *Aethale*. The port of Æthalia was called *Argous*, (Diod. Sicul.)

ÆTHELSTAN, ſee Athelstan.

ÆTHER, is uſually underſtood of a thin, ſubtile matter, or medium, much finer and rarer than air; which commencing from the limits of our atmoſphere, poſſeſſes the whole heavenly ſpace.—The word in Greek, αἰθήρ, ſuppoſed to be formed from the verb αἴθειν, "to burn, to flame;" ſome of the ancients, particularly Anaxagoras, ſuppoſing it of the nature of fire. See Fire.

The philoſophers cannot conceive that the largeſt part of the creation ſhould be perfectly void; and therefore they fill it with a ſpecies of matter under the denomination of *æther*. But they vary extremely as to the nature and character of this æther. Some conceive it as a body *ſui generis*, appointed only to fill up the vacuities between the heavenly bodies; and therefore confined to the regions above our atmoſphere. Others ſuppoſe it of ſo ſubtile and penetrating a nature, as to pervade the air, and other bodies, and poſſeſs the pores and intervals thereof. Others deny the exiſtence of any ſuch ſpecific matter; and think the air itſelf, by that immenſe tenuity and expanſion it is found capable of, may diffuſe itſelf through the interſtellar ſpaces, and be the only matter found therein.

In effect, æther, being no object of our ſenſe, but the mere work of imagination, brought only upon the ſtage for the ſake of hypotheſis, or to ſolve ſome phenomenon, real or imaginary; authors take the liberty to modify it how they pleaſe. Some ſuppoſe it of an elementary nature, like other bodies; and only diſtinguiſhed by its tenuity, and the other affections conſequent thereon: which is the philoſophical æther. Others will have it of another ſpecies, and not elementary; but rather a ſort of fifth element, of a purer, more refined, and ſpirituous nature, than the ſubſtances about our earth: and void of the common affections thereof, as gravity, &c. The heavenly ſpaces being the ſuppoſed region or reſidence of a more exalted claſs of beings, the medium muſt be more exalted in proportion. Such is the ancient and popular idea of æther, or ætherial matter.

The term *æther* being thus embarraſſed with a variety of ideas, and arbitrarily applied to ſo many different things, the later and ſeverer philoſophers chooſe to ſet it aſide, and in lieu thereof ſubſtitute other more determinate ones. Thus, the Carteſians uſe the term *materia ſubtilis*; which is their æther: and Sir Iſaac Newton, ſometimes a *ſubtile ſpirit*, as in the cloſe of his *Principia*; and ſometimes a *ſubtile* or *ætherial medium*, as in his *Optics*.

The truth is, there are abundance of conſiderations, which ſeem to evince the exiſtence of ſome matter in the air, much finer than the air itſelf. There is an unknown ſomething, which remains behind when the air is taken away; as appears from certain effects which we ſee produced *in vacuo*. Heat, Sir Iſaac Newton obſerves, is communicated through a vacuum almoſt as readily as through air: but ſuch communication cannot be without ſome interjacent body, to act as a medium. And ſuch body may be ſubtile enough to penetrate the pores of glaſs; and may be very well concluded to permeate thoſe of all other bodies, and conſequently be diffuſed through all the parts of ſpace which anſwers to the full character of an æther. See Heat.

Æther ‖ Æthuſa.

The exiſtence of ſuch an ætherial medium being ſettled, that author proceeds to its properties; inferring it to be not only rarer and more fluid than air, but exceedingly more elaſtic and active: in virtue of which properties, he ſhows, that a great part of the phenomena of nature may be produced by it. To the weight, *e. g.* of this medium, he attributes gravitation, or the weight of all other bodies; and to its elaſticity, the elaſtic force of the air and of nervous fibres, and the emiſſion, refraction, reflection, and other phenomena of light; as alſo, ſenſation, muſcular motion, &c. In fine, this ſame matter ſeems the *primum mobile*, the firſt ſource or ſpring of phyſical action in the modern ſyſtem.

The Carteſian æther is ſuppoſed not only to pervade, but adequately to fill, all the vacuities of bodies; and thus to make an abſolute plenum in the univerſe.

But Sir Iſaac Newton overturns this opinion, from divers conſiderations; by ſhowing, that the celeſtial ſpaces are void of all ſenſible reſiſtance: for, hence it follows, that the matter contained therein muſt be immenſely rare, in regard the reſiſtance of bodies is chiefly as their denſity; ſo that if the heavens were thus adequately filled with a medium or matter, how ſubtile ſoever, they would reſiſt the motion of the planets and comets much more than quickſilver or gold.

The late diſcoveries in electricity have thrown great light upon this ſubject, and rendered it extremely probable that the æther ſo often talked of is no other than the electric fluid, or ſolar light, which diffuſes itſelf throughout the whole ſyſtem of nature. See Electricity, Fire, Heat, Light, &c.

Æther, in chemiſtry, the lighteſt, moſt volatile, and moſt inflammable of all liquids, is produced by diſtillation of acids with rectified ſpirit of wine. See Chemistry and Pharmacy (the *Indexes*).

ÆTHERIAL, Etherius, ſomething that belongs to, or partakes of, the nature of Æther. Thus we ſay, the *ætherial ſpace*, *ætherial regions*, &c.

Some of the ancients divided the univerſe, with reſpect to the matter contained therein, into elementary and ætherial

Under the ætherial world was included all that ſpace above the uppermoſt element, viz. fire. This they ſuppoſed to be perfectly homogeneous, incorruptible, unchangeable, &c. See Corruption. The Chaldees placed an ætherial world between the empyreum and the region of the fixed ſtars. Beſide which, they ſometimes alſo ſpeak of a ſecond ætherial world, meaning by it the ſtarry orb; and a third ætherial world, by which is meant the planetary region.

ÆTHIOPIA. See Ethiopia.

ÆTHIOPS, *Mineral*, *Martial*, and *Antimonial*. See Pharmacy (*Index*).

ÆTHUSA, in botany, a genus of the pentandria digynia claſs; and, in the natural method, ranking under the 45th order, *Umbellatæ*. The characters are: The *calyx* is an univerſal umbel expanding, the interior rays ſhorter by degrees; with a partial umbel, ſmall, and expanding. There is no univerſal involucrum; the partial one is dimidiated, with three or five leaflets,

Aetians || Aetius.

lets, and pendulous; the proper perianthium scarcely discernible. The universal *corolla* is uniform, with fertile florets; the partial one has five heart-inflected unequal petals. The *stamina* consist of five simple filaments, with roundish antheræ. The *pistillum* is a germen beneath; with two reflected styli; the stigmata obtuse. There is no *pericarpium;* the fruit is ovate, striated, and tripartite. The *seeds* are two, roundish and striated. There is but one species, viz. the æthusa synapium, fools-parsley, or lesser hemlock (a native of Britain), which grows in corn-fields and gardens. This plant, from its resemblance to common parsley, hath sometimes been mistaken for it; and when eaten, it occasions sickness. If the curled-leaved parsley only was cultivated in our gardens, no such mistakes would happen in future. Cows, horses, sheep, goats, and swine, eat it. It is noxious to geese.

AETIANS, in church-history, a branch of Arians who maintained, that the Son and Holy Ghost are in all things dissimilar to the Father. See Aetius.

ÆTIOLOGY, is that part of Pathology which is employed in exploring the causes of diseases.

AETION, a celebrated painter, who has left us an excellent picture of Roxana and Alexander, which he exhibited at the Olympic Games: it represents a magnificent chamber, where Roxana is sitting on a bed of a most splendid appearance, which is rendered still more brilliant by her beauty. She looks downwards, in a kind of confusion, being struck with the presence of Alexander standing before her. A number of little Cupids flutter about, some holding up the curtain, as if to show Roxana to the prince, whilst others are busied in undressing the lady; some pull Alexander by the cloak, who appears like a young bashful bridegroom, and present him to his mistress: he lays his crown at her feet, being accompanied by Ephestion, who holds a torch in his hand, and leans upon a youth, who represents Hymen. Several other little Cupids are represented playing with his arms; some carry his lance, stooping under so heavy a weight; others bear along his buckler, upon which one of them is seated, whom the rest carry in triumph; another lies in ambush in his armour, waiting to frighten the rest as they pass by. This picture gained Aetion so much reputation, that the president of the games gave him his daughter in marriage.

ÆTITES, or Eagle-stone, in natural history, a flinty or crustated stone, hollow within, and containing a *nucleus*, which, on shaking, rattles within. It was formerly in repute for several extraordinary magical as well as medical powers; such as preventing abortion, discovering thieves, and other ridiculous properties. The word is formed from αετος, "eagle;" the popular tradition being, that it is found in the eagle's nest, whither it is supposed to be carried while the female sits, to prevent her eggs from being rotten. It is found in several parts: near Trevoux in France, one can scarce dig a few feet, without finding considerable strata or beds of the coarser or ferruginous kind. They are originally soft, and of the colour of yellow oaker. But the finest and most valued of all the eagle-stones, are accidental states of one or other of our common pebbles.

AETIUS, one of the most zealous defenders of Arianism, was born in Syria, and flourished about the year 336. After being servant to a grammarian, of whom he learned grammar and logic, he was ordained deacon, and at length bishop, by Eudoxus patriarch of Constantinople. St Epiphanius has preserved 47 of his propositions against the Trinity. His followers were called Aetians.

Aetius, Ætna.

Aetius, a famous physician, born at Amida in Mesopotamia, and the author of a work intitled *Tetrabiblos*, which is a collection from the writings of those physicians who went before him. He lived, according to Dr Freind, at the end of the 5th or the beginning of the 6th century.

Aetius, governor of Gallia Narbonensis in the reign of Valentinian III. forced the Franks who were passing into Gaul to repass the Rhine. He defeated the Goths; and routed Attila king of the Huns, who invaded Gaul with an army of 700,000 men. But the emperor, jealous of the merit of this great man, killed him in 454 with his own hand, under the pretence that he had permitted the invasion of the Huns, after Attila's defeat.

ÆTNA, (in the Itineraries *Æthna*, supposed from αιθω, "to burn"; according to Bochart, from *Athuna*, a furnace, or *Ætuna*, darkness), now *Monte Gibello:* a vulcano or burning mountain of Sicily, situated in lat. 38°. N. long. 15°. E.

This mountain, famous from the remotest antiquity, both for its bulk and terrible eruptions, stands in the eastern part of the island, in a very extensive plain, called *Val Demoni*, from the notion of its being inhabited by devils, who torment the spirits of the damned in the bowels of this vulcano.

Inconsistent accounts concerning the magnitude of Ætna.

Concerning the dimensions of mount Ætna, we can scarce extract any thing consistent, even from the accounts of the latest and most ingenious travellers. Pindar, who lived about 435 years before Christ, calls it the *Pillar of heaven*, on account of its great height. All modern writers likewise agree, that this mountain is very high, and very large; but differ excessively both as to its height and magnitude: some making it no less than twelve miles high, others eight, others six, some four, while Mr Brydone, and Sir William Hamilton, who lately ascended to its highest summit, reduce its height to little more than two miles; nay, by some it is reduced to 10,036 feet, somewhat less than two miles. No less remarkable are the differences concerning its circumference: some making it only 60 miles round, others 100; and Signior Recupero, from whom Mr Brydone had his information in this respect, affirms it to be no less than 183 miles in circuit.

We are sorry to detract from the merit of Mr Brydone, or to involve in obscurity what he hath been at so much pains to elucidate; but every person who compares the account of mount Ætna's circumference, given by Signior Recupero, and to which Mr Brydone seems to have assented, with its apparent circumference on the map prefixed to that gentleman's tour through Sicily and Malta, must at once be struck with the prodigious disparity. Indeed, it is plain, that, in the map, the geographer hath not left room for any such mountain; nor can we help thinking, that, by comparing the distances of some of the Sicilian towns from one another, Signior Recupero's dimensions will be found enormously egaggerated.—Certain it is, that there the geographer hath placed Catania, which stands at the foot of mount Ætna, on one side, no more than 28 miles from the most distant point of the river Alcantara,

Ætna.

tara, which forms the boundary on the oppoſite ſide; ſo that a circle, whoſe radius is 14 or 15 miles, muſt encompaſs as much ſpace as we can poſſibly think is occupied by the baſis of mount Ætna. Thus we will reduce the circumference of this famous mountain to between 80 and 90 miles; and even when we do ſo, it muſt ſtill be acknowledged to be very great.

But if we are embarraſſed with the circumference of Ætna, we are much more ſo with the accounts relating to its height; and one circumſtance, particularly, creates almoſt inſurmountable difficulties. It is agreed upon by all travellers, and among the reſt by Sir William Hamilton, that from Catania, where the aſcent firſt begins, to the ſummit, is not leſs than 30 miles. The deſcent on the other ſide we have no account of; but, whatever ſuppoſition we make, the height of the mountain muſt be prodigious. If we ſuppoſe it likewiſe to be 30 miles, and that mount Ætna can be repreſented by an equilateral triangle, each of whoſe ſides is 30 miles, we will have an amazing elevation indeed, no leſs than 26 miles perpendicular!—Such a height being beyond all credibility, we muſt contract the ſides of our triangle, in proportion to its baſis. We ſhall begin with allowing 10 miles for the difference between a ſtraight line from Catania to the ſummit, and the length of the road, occaſioned by the inequalities of the mountain; and ſuppoſing the deſcent on the other ſide to be ſomewhat ſhorter, we may call it 15 miles. Mount Ætna will now be repreſented by a ſcalene triangle, whoſe baſe is 30 miles, its longeſt ſide 20, and its ſhorteſt 15; from which proportions we will ſtill find its height to be betwixt eight and nine miles.—This is ſtill incredible; and when all the various relations concerning the height of Ætna are compared, we hope it will not be thought preſumptuous in us to give it as our opinion, that the true dimenſions of this mountain are as yet unknown. The following meaſures are given by different authors:

Dimenſions uncertain.

Height above the ſurface of the ſea, 10,036 feet.

One hundred and eighty miles circumference at the baſe.—Faujas de S. Fon in his Volcans du Vivarais.

Height 12,000 feet.—Brydone. Tour to Sicily.

Height 2500 toiſes.—La Platrière, ſaid as from Recupero.

Height 1950 toiſes.—Diameter 30 miles.—Mentelle Geogr. comp.

Others make its height only 2000 toiſes, and its ſuperfices 300 ſquare miles.

General appearance, &c.

Concerning the products and general appearance of this vulcano, authors are much better agreed.—The journey from Catania to its ſummit has been lately deſcribed by three travellers, M. D'Orville, Mr Brydone, and Sir William Hamilton. All theſe agree, that this ſingle mountain affords an epitome of the different climates throughout the whole world: towards the foot, it is very hot; farther up, more temperate; and grows gradually more and more cold the higher we aſcend. At the very top, it is perpetually covered with ſnow: from thence the whole iſland is ſupplied with that article, ſo neceſſary in a hot climate, and without which the natives ſay Sicily could not be inhabited. So great is the demand for this commodity, that the biſhop's revenues, which are conſiderable, ariſe from the ſale of mount Ætna's ſnow; and he is ſaid to draw 1000 *l.* a-year from one ſmall portion lying on the north ſide of the mountain. Great quantities of ſnow and ice are likewiſe exported to Malta and Italy, making a conſiderable branch of commerce. On the north ſide of this ſnowy region, Mr Brydone was aſſured, that there are ſeveral ſmall lakes which never thaw; and that the ſnow mixed with the aſhes and ſalt of the mountain are accumulated to a vaſt depth. The quantity of ſalts contained in this mountain, he, with great probability, conjectures to be one reaſon of the preſervation of its ſnows; for ſalt increaſes the coldneſs of ſnow to a ſurpriſing degree*.

In the middle of the ſnowy regions ſtands the great *crater*, or mouth of Ætna; from which, though contrary to the uſual method of travellers, we ſhall begin our particular account of this mountain. Sir William Hamilton deſcribes the crater as a little mountain, about a quarter of a mile perpendicular, and very ſteep, ſituated in the middle of a gently inclining plain, of about nine miles in circumference. It is entirely formed of ſtones and aſhes; and, as Mr Hamilton was informed by ſeveral people of Catania, had been thrown up about 25 or 30 years before the time (1769) he viſited mount Ætna. Before this mountain was thrown up, there was only a prodigious large chaſm, or gulph, in the middle of the above-mentioned plain; and it has been remarked, that about once in 100 years the top of Ætna falls in; which undoubtedly muſt be the caſe at certain periods, or the mountain behoved continually to increaſe in height. As this little mountain, though emitting ſmoke from every pore, appeared ſolid and firm, Mr Hamilton and his companions went up to the very top. In the middle is a hollow, about two miles and a half in circumference, according to Mr Hamilton; three miles and a half, according to Mr Brydone; and three or four, according to Mr D'Orville. The inſide is cruſted over with ſalts and ſulphur of different colours. It goes ſhelving down, from the top, like an inverted cone; the depth, in Mr Hamilton's opinion, nearly correſponding to the height of the little mountain. From many places of this ſpace iſſue volumes of ſulphureous ſmoke, which being much heavier than the circumambient air, inſtead of aſcending in it, roll down the ſide of the mountain, till, coming to a more denſe atmoſphere, it ſhoots off horizontally, and forms a large tract in the air, according to the direction of the wind; which, happily for our travellers, carried it exactly to the ſide oppoſite to which they were placed. In the middle of this funnel is the tremenduous and unfathomable gulph, ſo much celebrated in all ages, both as the terror of this life, and the place of puniſhment in the next. From this gulph continually iſſue terrible and confuſed noiſes, which in eruptions are increaſed to ſuch a degree as to be heard at a prodigious diſtance. Its diameter is probably very different at different times: for Mr Hamilton obſerved, by the wind clearing away the ſmoke from time to time, that the inverted hollow cone was contracted almoſt to a point; while Mr D'Orville and Mr Brydone found the opening very large. Both Mr Brydone and Mr Hamilton found the crater too hot to deſcend into it; but Mr D'Orville was bolder: and accordingly he and his fellow-traveller, faſtened to ropes which two or three men held at a diſtance for fear of accidents, deſcended as near as poſſible to the brink of the gulph; but the ſmall flames and ſmoke which iſſued from it on every ſide, and a greeniſh ſulphur, and pumice-ſtones, quite black, which covered the margin, would not permit them to come ſo near

Crater deſcribed.

* See *Cold*, and *Congelation*.

as

Ætna.

as to have a full view. They only saw distinctly in the middle, a mass of matter which rose, in the shape of a cone, to the height of above 60 feet, and which towards the base, as far as their sight could reach, might be 600 or 800. While they were observing this substance, some motion was perceived on the north side, opposite to that whereon they stood; and immediately the mountain began to send forth smoke and ashes. This eruption was preceded by a sensible increase of its internal roarings; which, however, did not continue; but after a moment's dilatation, as if to give it vent, the vulcano resumed its former tranquillity; but as it was by no means proper to make a long stay in such a place, our travellers immediately returned to their attendants.

On the summit of mount Ætna, Mr Hamilton observes, that he was sensible of a difficulty in respiration from the too great subtilty of the air, independent of what arose from the sulphureous smoke of the mountain. Mr Brydone takes no notice of this; which probably arose from the air being in a more rarefied state at the time of Mr Hamilton's observation than of Mr Brydone's; the barometer, as observed by the former, standing at 18 inches and 10 lines, by the latter at 19 inches $6\frac{1}{2}$ lines.

In these high regions there is generally a very violend wind, which, as all our travellers found it constantly blowing from the south, may possibly be commonly directed from that point. Here Mr Brydone's thermometer fell to 27°.

Splendor of the stars seen from the top of Ætna.

The top of Ætna being above the common region of vapours, the heavens appear with exceeding great splendor.—Mr Brydone and his company observed, as they ascended in the night, that the number of stars seemed to be infinitely increased, and the light of each of them appeared brighter than usual; the whiteness of the milky-way was like a pure flame which shot across the heavens; and, with the naked eye, they could observe clusters of stars that were invisible from below. Had Jupiter been visible, he is of opinion that some of his sattellites might have been discovered with the naked eye, or at least with a very small pocket-glass. He likewise took notice of several of those meteors called *falling stars*; which appeared as much elevated as when viewed from the plain: a proof, according to Mr Brydone, that "these bodies move in regions much beyond the bounds that some philosophers have assigned to our atmosphere."

Extensive prospect.

To have a full and clear prospect from the summit of mount Ætna, it is necessary to be there before sunrise; as the vapours raised by the sun, in the day-time, will obscure every object: accordingly, our travellers took care to arrive there early enough; and all agree, that the beauty of the prospect from thence cannot be expressed.—Here Mr Brydone and Mr Hamilton had a view of Calabria in Italy, with the sea beyond it; the Lipari islands, and Stromboli a vulcano at about 70 miles distance, appeared just under their feet; the whole island of Sicily, with its rivers, towns, harbours, &c. appeared distinct, as if seen on a map. Massa, a Sicilian author, affirms, that the African coast, as well as that of Naples, with many of its islands, have been discovered from the top of Ætna. The visible horizon here is not less than 8 or 900 miles in diameter. The pyramidal shadow of the mountain reaches across the whole island, and far into the sea on the other side, forming a visible tract in the air, which, as the sun rises above the horizon, is shortened, and at last confined to the neighbourhood of Ætna. The most beautiful part of the scene, however, in Mr Brydone's opinion, is the mountain itself, the island of Sicily, and the numerous islands lying round it. These last seem to be close to the skirts of Ætna; the distances appearing reduced to nothing.

Division into three zones.

This mountain is divided into three zones, which might properly enough be distinguished by the names of *torrid*, *temperate*, and *frigid*: they are, however, known by the names of the *Piedmontese*, or *Regione culta*, the cultivated, or fertile region; the *Sylvosa*, woody, or temperate zone; and the *Regione deserta*, the frigid, or desert zone, or region. All these are plainly distinguished from the summit. The *Regione deserta* is marked out by a circle of snow and ice, which extends on all sides to the distance of about eight miles, beginning at the foot of the crater. Greatest part of this region is smooth and even. This is immediately succeeded by the *Sylvosa*, or woody region; which forms a circle of the most beautiful green, surrounding the mountain on all sides. This region is variegated with a vast number of mountains of a conical form, thrown up by Ætna in those eruptions which burst out from its sides. Mr Hamilton counted 44 on the Catania side, each having its crater, many with large trees flourishing both within and without the crater. All these, except a few of late date, have acquired a wonderful degree of fertility. The circumference of this zone, or great circle, according to Recupero, is not less than 70 or 80 miles. It is everywhere succeeded by the *Regione culta*; which is much broader than the rest, and extends on all sides to the foot of the mountain. Here terrible devastations are sometimes committed by the eruptions; and the whole region is likewise full of conical mountains thrown up by them. The circumference of this region, is, by Recupero, reckoned 183 miles; but we have already given our reasons for rejecting these dimensions.—This region is bounded by the sea to the south and south-east; and on all other sides, by the river Semetus and Alcantara, which form the boundaries of mount Ætna.

Regione deserta.

Il Torre del Filosofo.

About a mile below the foot of the great crater, are found the ruins of an ancient structure, called *Il Torre del Filosofo*, by some supposed to have been built by the philosopher Empedocles, who took up his habitation here, the better to study the nature of mount Ætna. By others they are supposed to be ruins of a temple of Vulcan. They are of brick, and seem to have been ornamented with marble. Somewhere in this region also, Mr D'Orville found a great oblong block of polished marble, eight or ten feet high, and three or four thick; though how it came there, was quite unaccountable to him. From Mr D'Orville's and Mr Brydone's accounts, we must reckon this part of the mountain pretty steep: but Mr Hamilton says, that the ascent was so gradual, as not to be in the least fatiguing; and had it not been for the snows, they might have rode on their mules to the very foot of the crater.

Regione Sylvosa.

The woody region descends eight or nine miles below the *Regione deserta*, but differs greatly in the temperature of its climate. Mr Hamilton observed a gradual decrease of the vegetation as he advanced; the under part being covered with large timber trees, which

Ætna. grew gradually leſs as he approached the third region, at laſt they degenerated into the ſmall plants of the northern climates. He alſo obſerved quantities of juniper and tanſey; and was informed by his guide, that later in the ſeaſon (he viſited Ætna in June 1769) there are a great many curious plants, and in ſome places rhubarb and ſaffron in great plenty. In Carrera's hiſtory of Catania, there is a liſt of all the plants and herbs of Ætna, in alphabetical order.

This region is extolled by Mr Brydone as one of the moſt delightful ſpots on earth. He lodged for a night in a large cave near the middle, formed by one of the moſt ancient lavas. It is called *La Spelonca del Capriole*, or the goats cavern; becauſe it is frequented by thoſe animals, which take refuge there in bad weather. Here his reſt was diſturbed by a mountain thrown up in the eruption 1766. It diſcharged great quantities of ſmoke, and made ſeveral exploſions like heavy cannon fired at a diſtance; but they could obſerve no appearance of fire.

This gentleman likewiſe viſited the eaſtern ſide of the *Regione ſylvoſa*, intending to have aſcended that way to the ſummit, and deſcended again on the ſouth ſide to Catania; but found it impracticable; though what the inſurmountable difficulties were, he does not mention. On this ſide, part of the woody region was deſtroyed, in 1755, by an immenſe torrent of boiling water, which iſſued from the great crater. Its traces were ſtill very viſible, about a mile and an half broad, and in ſome places more. The ſoil was then only beginning to recover its vegetative power, which it ſeems this torrent had deſtroyed for 14 years.—Near this place are ſome beautiful woods of cork, and evergreen oak, growing abſolutely out of the lava, the ſoil having hardly filled the crevices; and not far off, our traveller obſerved ſeven little mountains that ſeemed to have been formed by a late eruption. Each of theſe had a regular cup, or crater, on the top; and, in ſome, the middle gulph, or *Voragine*, as the Sicilians call it, was ſtill open. Into theſe gulphs Mr Brydone tumbled down ſtones, and heard the noiſe for a long time after. All the fields round, to a conſiderable diſtance, were covered with large burnt ſtones diſcharged from theſe little vulcanoes.

Eruption of boiling water.

Overgrown cheſtnut-trees.

The woody region, eſpecially the eaſt ſide, called *Carpinetto*, abounds with very large cheſtnut-trees; the moſt remarkable of which has been called, from its ſize, *Caſtagno de Cento Cavalli*, or cheſtnut-tree of an hundred horſe. Mr Brydone was greatly diſapppointed at the ſight of this tree, as it is only a buſh of five large ones growing together: but his guides aſſured him, that all theſe five were once united into one ſtem; and Signior Recupero told him, that he himſelf had been at the expence of carrying up peaſants with tools to dig round this buſh of trees, and found all the ſtems united below ground in one root. The circumference, as meaſured by Meſſrs Brydone and Glover who accompanied him, amounted to 204 feet. Another of theſe, about a mile and a half higher on the mountain, is called *Caſtagna del Galea*: it riſes from one ſolid ſtem to a conſiderable height; after which it branches out, and is a much finer object than the other: this was meaſured two feet above the ground, and found to be 76 feet in circumference. A third, called *Caſtagna del Nave*, is pretty nearly of the ſame ſize; and Maſſa, one of the moſt eſteemed Sicilian authors, affirms that he has ſeen ſolid oaks there upwards of 40 feet round All theſe grow on a thick rich ſoil, which ſeems originally to have been formed of aſhes thrown out by the mountain. Here the barometer ſtood at 26 inches 5 lines and an half, indicating an elevation of near 4000 feet.

Regione Culta.

The Piedmonteſe diſtrict is covered with towns, villages, monaſteries, &c. and is well peopled, notwithſtanding the danger of ſuch a ſituation: but the fertility of the ſoil tempts people to inhabit that country; and their ſuperſtitious confidence in their ſaints, with the propenſity mankind have to deſpiſe danger which they do not ſee, render them as ſecure there as in any other place. Here, Sir William Hamilton obſerves, they keep their vines low, contrary to the cuſtom of thoſe who inhabit mount Veſuvius; and they produce a ſtronger wine, but not in ſuch abundance: here alſo many terrible eruptions have burſt forth; particularly one in 1669. At the foot of the mountain raiſed by that eruption, is a hole, through which Sir William Hamilton deſcended, by means of a rope, into ſeveral ſubterraneous caverns, branching out, and extending much farther than he choſe to venture, the cold there being exceſſive, and a violent wind extinguiſhing ſome of the torches. Many other caverns are known in this, and the other regions of Ætna; particularly one near this place called *La Spelonca della Palomba*, (from the wild pigeons building their neſts there.) Here Mr Brydone was told that ſome people had loſt their ſenſes, from having advanced too far, imagining they ſaw devils and damned ſpirits.—Some of theſe caverns are made uſe of as magazines for ſnow; which they are well adapted for, on account of their extreme cold. Theſe are with great probability ſuppoſed by Sir William Hamilton to be the hollows made by the iſſuing of the lava in eruptions.

Subterraneous caverns.

River Acis.

In this region the river *Acis*, ſo much celebrated by the poets, in the fable of Acis and Galatea, takes its riſe. It burſts out of the earth at once in a large ſtream, runs with great rapidity, and about a mile from its ſource throws itſelf into the ſea. Its water is remarkably clear; and ſo extremely cold, that it is reckoned dangerous to drink it: it is ſaid, however, to have a poiſonous quality, from being impregnated with vitriol; in conſequence of which cattle have been killed by it. It never freezes, but is ſaid often to contract a greater degree of cold than ice.

Appearances during an eruption.

Having thus given an account of this mountain in its quiet and peaceable ſtate, we muſt now deſcribe the appearance it puts on during the time of an eruption, when it ſpreads deſtruction for many miles round, and is capable of ſtriking the boldeſt with terror.

Sir William Hamilton, who has examined both Veſuvius and Ætna in a very accurate manner, never had an opportunity of ſeeing an eruption of the latter; but as he is of opinion that the two vulcanoes agree perfectly in all reſpects, only that the latter is on a much larger ſcale than the former, we hope it will not be unacceptable to our readers to give an account of ſome of the general appearances of Veſuvius when in a ſtate of eruption, the better to help their ideas concerning Ætna.

It has been already obſerved, that a ſmoke conſtantly iſſues from the top of Ætna, and that its internal noiſes never ceaſe. The caſe is the ſame with Veſuvius;

Ætna.

vius: and Sir William Hamilton obferved, that in bad weather the fmoke was more confiderable, as well as the noifes much louder, than when it was fair; fo that in bad weather he had frequently heard the inward explofions of the mountain at Naples fix miles diftant from Vefuvius. He alfo obferved the fmoke that iffued from the mountain in bad weather to be very white, moift, and not near fo offenfive as the fulphureous fteams from various cracks in the fide of the mountain.

Signs of an approaching eruption.

The firft fymptom of an approaching eruption is an increafe of the fmoke in fair weather: after fome time, a puff of black fmoke is frequently feen to fhoot up in the midft of the white, to a confiderable height. Thefe puffs are attended with confiderable explofions: for while Vefuvius was in this ftate, Sir William Hamilton went up to its top, which was covered with fnow; and perceiving a little hillock of fulphur, about fix feet high, which had been lately thrown up, and burnt with a blue flame at the top, he was examining this phenomenon, when fuddenly a violent report was heard, a column of black fmoke fhot up with violence, and was followed by a reddifh flame. Immediately a fhower of ftones fell; upon which he thought proper to retire. Phenomena of this kind, in all probability, precede the eruptions of Ætna in a much greater degree.—The fmoke at length appears wholly black in the day-time, and in the night has the appearance of flame; fhowers of afhes are fent forth, earthquakes are produced, the mountain difcharges volleys of red-hot ftones to a great height in the air. The force by which thefe ftones are projected, as well as their magnitudes, feems to be in proportion to the bulk of the mountain. Signior Recupero affured Mr Brydone, that he had feen immenfely large ones thrown perpendicularly upwards to the height of 7000 feet, as he calculated from the time they took to arrive at the earth after beginning to defcend from their greateft elevation. The largeft ftone, or rather rock, that was ever known to be emitted by Vefuvius, was 12 feet long and 45 in circumference. This was thrown a quarter of a mile; but much larger ones have been thrown out by mount Ætna, almoft in the proportion in which the latter exceeds Vefuvius in bulk. Along with thefe terrible fymptoms, the fmoke that iffues from the crater is fometimes in a highly electrified ftate. In this cafe, the fmall afhes which are continually emitted from the crater, are attracted by the fmoke, and rife with it to a great height, forming a vaft black, and to appearance denfe, column; from this column continual flafhes of forked or zig-zag lightning iffue, fometimes attended with thunder, and fometimes not, but equally powerful with ordinary lightning. This phenomenon was obferved by Sir William Hamilton in the fmoke of Vefuvius, and has alfo been taken notice of in that of Ætna; and where this electrified fmoke hath fpread over a tract of land, much mifchief hath been done by the lightning proceeding from it.

Hamilton's Obfervations, p. 4.

Thunder & lightning from the fmoke.

When thefe dreadful appearances have continued fometimes four or five months, the *lava* begins to make its appearance. This is a ftream of melted mineral matters, which in Vefuvius commonly boils over the top, but very feldom does fo in Ætna; owing to the great weight of the lava, which long before it can be raifed to the vaft height of mount Ætna, burfts out through fome weak place in its fide. Upon the appearance of the lava, the violent eruptions of the mountain generally, though not always, ceafe; for if this burning matter gets not fufficient vent, the commotions increafe to a prodigious degree.—In the night-time the lava appears like a ftream of fire, accompanied with flame: but in the day-time it has no fuch appearance; its progrefs is marked by a white fmoke, which by the reflection of the red-hot matter in the night affumes the appearance of flame.

Eruption in 1669.

All the abovementioned fymptoms preceded the great eruption of Ætna in 1669. For feveral months before the lava broke forth, the *old mouth*, or great crater on the fummit, was obferved to fend forth great quantities of fmoke and flame; the top had fallen in, fo that the mountain was much lowered; the iflands alfo of Volcan and Stromboli, two volcanoes to the weftward of Sicily, were obferved to rage more than ufual.—Eighteen days before the eruption, the fky was very thick and dark, with thunder, lightning, frequent concuffions of the earth, and dreadful fubterraneous bellowings. On the 11th of March, fome time before the lava got vent, a rent was opened in the mountain twelve miles in length, into which, when ftones were thrown down, they could not be heard to ftrike the bottom. Burning rocks, 60 palms (15 of our feet) in length, were thrown to the diftance of a mile; others of a leffer fize were carried three miles off; the internal noifes of the mountain were exceedingly dreadful, and the thunder and lightning from the fmoke fcarce lefs terrible than they. When the lava at laft got vent, it burft out of a vineyard, 20 miles below the great crater, and fprung up into the air to a confiderable height. Here it formed a mountain of ftones and afhes, not lefs, as Sir Wm Hamilton conjectures, than half a mile perpendicular in height, and three miles in circumference. For 54 days neither fun nor ftars had appeared: but foon after the lava got vent, the mountain became very quiet. The terrible effects of this fiery ftream may be imagined from its amazing extent; being, as Sir Wm Hamilton obferves, no lefs than 14 miles long, and in many places fix in breadth. In its courfe, it deftroyed the habitations of near 30,000 perfons; and meeting with a lake four miles in compafs, it not only filled it up, though feveral fathom deep, but made a mountain in the place of it. Having reached Catanea, it deftroyed part of its walls, and ran for a confiderable length into the fea, forming a fafe and beautiful harbour; which, however, was foon filled up by a frefh torrent of the fame inflamed matter.

Phenomena at the breaking forth of the lava.

It is not eafy for thofe who have never been prefent at thofe terrible operations of nature, to reprefent to their minds the horror which muft attend the breaking forth of the lava; for though the giving vent to this burning matter generally produces a ceffation of the violent efforts of the internal fire, yet at the very inftant of its explofion fcarce any thing can be conceived fo dreadful. See Vesuvius.

Hamilton's obfervations, p. 10.

When the lava firft iffues, it appears very fluid, and runs with the rapidity of a fwift river; but even then it furprifingly refifts the impreffion of folid bodies: for Sir Wm Hamilton could not pierce that of Vefuvius with a ftick driven againft it with all his force; nor did the largeft ftone he was able to throw upon it fink, but made a flight impreffion, and then floated along. This happened almoft at the very mouth, when the lava appear-

Ætna. ed liquid as water, and when he ſaw it running with a rapidity equal to the river Severn at the paſſage near Briſtol.—A deſcription of the lava iſſuing from mount Ætna in 1669 was ſent to the court of England by Lord Winchelſea, who at that time happened to be at Catania in his way home from an embaſſy at Conſtantinople. His account is not now to be procured; but Mr Hamilton found a copy in Sicily, and hath given an extract, part of which follows. "When it was night, I went upon two towers in divers places; and I could plainly ſee, at ten miles diſtance, as we judged, the fire begin to run from the mountain in a direct line, the flame to aſcend as high and as big as one of the greateſt ſteeples in your Majeſty's kingdoms, and to throw up great ſtones into the air; I could diſcern the river of fire to deſcend the mountain of a terrible fiery or red colour, and ſtones of a paler red to ſwim thereon, and to be ſome as big as an ordinary table. We could ſee this fire to move in ſeveral other places, and all the country covered with fire, aſcending with great flames in many places, ſmoking like to a violent furnace of iron melted, making a noiſe with the great pieces that fell, eſpecially thoſe that fell into the ſea. A cavalier of Malta, who lives there, and attended me, told me, that the river was as liquid, where it iſſues out of the mountain, as water, and came out like a torrent with great violence, and is five or ſix fathom deep, and as broad, and that no ſtones ſink therein."

Lava of 1669 deſcribed.

The account given in the Philoſophical Tranſactions is to the ſame purpoſe. We are there told, that the lava is "nothing elſe than diverſe kinds of metals and minerals, rendered liquid by the fierceneſs of the fire in the bowels of the earth, boiling up and guſhing forth as the water doth at the head of ſome great river; and having run in a full body for a ſtone's caſt or more, began to cruſt or curdle, becoming, when cold, thoſe hard porous ſtones which the people call *Sciarri*." Thoſe, though cold in compariſon of what firſt iſſues from the mountain, yet retained ſo much heat as to reſemble huge cakes of ſea-coal ſtrongly ignited, and came tumbling over one another, bearing down or burning whatever was in their way.—In this manner the lava proceeded ſlowly on till it came to the ſea, when a moſt extraordinary conflict enſued betwixt the two adverſe elements. The noiſe was vaſtly more dreadful than the loudeſt thunder, being heard thro' the whole country to an immenſe diſtance; the water ſeemed to retire and diminiſh before the lava, while clouds of vapour darkened the ſun. The whole fiſh on the coaſt were deſtroyed, the colour of the ſea itſelf was changed, and the tranſparency of its waters loſt for many months.

While this lava was iſſuing in ſuch prodigious quantity, the merchants, whoſe account is recorded in the Philoſophical Tranſactions, attempted to go up to the mouth itſelf; but durſt not come nearer than a furlong, leſt they ſhould have been overwhelmed by a vaſt pillar of aſhes, which to their apprehenſion exceeded twice the bigneſs of St Paul's ſteeple in London, and went up into the air to a far greater height; at the mouth itſelf was a continual noiſe, like the beating of great waves of the ſea againſt rocks, or like diſtant thunder, which ſometimes was ſo violent as to be heard 60, or even 100 miles off; to which diſtance alſo part of the aſhes were carried. Some time after, having gone up, they found the mouth from whence this terrible deluge iſſued to be only a hole about 10 feet diameter. This is alſo confirmed by Mr Brydone; and is probably the ſame through which Sir W^m^ Hamilton deſcended into the ſubterranean caverns already mentioned.

Ætna. Diameter of the hole whence the lava iſſued.

Mount Ætna, as we have already remarked, has been a celebrated volcano from the remoteſt antiquity. Diodorus Siculus mentions eruptions of it as happening 500 years before the Trojan war, or 1693 years before the Chriſtian æra. From Homer's ſilence with regard to the phenomenon of Ætna, it is to be preſumed that the volcano had been many ages in a ſtate of inactivity, and that no tradition of its burning remained among the inhabitants at the time he compoſed his Odyſſey; perhaps it never had emitted flames ſince the country was peopled. The firſt eruption taken notice of by ancient, but by no means cotemporary authors, happened before the Greeks landed on the iſland, and is ſuppoſed to have ſcared the Sicani from the eaſt part of Sicily.

Antiquity of the eruptions.

Pindar, quoted above, is the oldeſt writer extant who ſpeaks of Ætna as a volcano. The firſt recorded eruption was in the time of Pythagoras. Plato was invited by the younger Dyoniſius to examine the ſtate of the mountain after the ſixth. It threw up flames and lava near an hundred times between that period and the battle of Pharſalia; it was particularly furious while Sextus Pompeius was adding the horrors of war to its devaſtations. Charlemagne happened to be at Catania during one of the eruptions; and from his reign the chronicles mention fifteen down to that of the year 1669, the moſt terrible of them all. Since 1669 there have been ſeveral eruptions, but none of them comparable to it. In that which happened in 1766, the lava ſprung up into the air to a conſiderable height, twelve miles below the ſummit; but formed a ſtream only ſix miles in length and one mile in breadth.

The laſt eruption happened in 1787. From the 1ſt to the 10th of July, there were ſigns of its approach. On the 11th, after a little calm, there was a ſubterraneous noiſe, like the ſound of a drum in a cloſe place, and it was followed by a copious burſt of black ſmoke. It was then calm till the 15th, when the ſame prognoſtics recurred. On the 17th, the ſubterraneous noiſe was heard again; the ſmoke was more abundant, ſlight ſhocks of an earthquake followed, and the lava flowed from behind one of the two little mountains which form the double head of Ætna. On the 18th, while the ſpectators were in anxious expectation of a more ſevere eruption, all was quiet, and continued ſo more than 12 hours: ſoon after they perceived ſome new ſhocks, accompanied with much noiſe; and the mountain threw out a thick ſmoke, which, as the wind was weſterly, ſoon darkened the eaſtern horizon: two hours afterwards a ſhower of fine black brilliant ſand deſcended: on the eaſt ſide it was a ſtorm of ſtones; and, at the foot of the mountain, a deluge of flaſhes of fire, of ſcoria and lava.

Account of the late eruption, 1787.

Theſe appearances continued the whole day; at the ſetting of the ſun the ſcene changed. A number of conical flames roſe from the volcano; one on the north, another on the ſouth, were very conſpicuous, and roſe and fell alternately. At three in the morning, the mountain appeared cleft, and the ſummit ſeemed a burning maſs. The cones of light which aroſe from the crater were of an immenſe extent, particularly the two

juſt

juft mentioned. The two heads feemed to be cut away; and at their feparation was a cone of flame, feemingly compofed of many leffer cones. The flame feemed of the height of the mountain placed on the mountain; fo that it was probably two miles high, on a bafe of a mile and a half in diameter. This cone was ftill covered with a very thick fmoke, in which there appeared very brilliant flafhes of lightning, a phenomenon which Ætna had not before afforded. At times, founds like thofe from the explofion of a large cannon were heard feemingly at a lefs diftance than the mountain. From the cone, as from a fountain, a jet of many flaming volcanic matters were thrown, which were carried to the diftance of fix or feven miles: from the bafe of the cone a thick fmoke arofe, which, for a moment, obfcured fome parts of the flame, at the time when the rivers of lava broke out. This beautiful appearance continued three quarters of an hour. It began the next night with more force; but continued only half an hour. In the intervals, however, Ætna continued to throw out flames, fmoke, ftones ignited, and fhowers of fand. From the 20th to the 22d, the appearances gradually ceafed. The ftream of lava was carried towards Bronte and the plain of Lago.

After the eruption, the top of the mountain on the weftern fide was found covered with hardened lava, fcoria, and ftones. The travellers were annoyed by fmoke, by fhowers of fand, mephitic vapours, and exceffive heat. They faw that the lava which came from the weftern point divided into two branches, one of which was directed towards Libeccio; the other, as we have already faid, towards the plain of Lago. The lava on the weftern head of the mountain, had from its various fhapes been evidently in a ftate of fufion: from one of the fpiracula, the odour was ftrongly that of liver of fulphur. The thermometer, in defcending, was at 40 degrees of Farenheit's fcale; while near the lava, in the plain of Lago, it was 140 degrees. The lava extended two miles; its width was from $13\frac{3}{4}$ to 21 feet, and its depth $13\frac{3}{4}$ feet.

Thefe are the moft remarkable circumftances we have been able to collect, that might ferve to give an adequate idea of this famous mountain.—Many things, however, concerning the extent, antiquity, &c. of the lavas, remain to be difcuffed, as well as the opinions of philofophers concerning the origin of the internal fire which produces fo much mifchief: but the confideration of thefe belongs to the general article Volcano, to which the reader is referred.—The fate of *Catania* and *Hybla*, which have often been deftroyed by eruptions, will be mentioned under thefe two words.

Ætna *falt*, *Sal Ætnæ*, a name given by fome authors to the fal ammoniac, which is found on the furface and fides of the openings of Ætna, and other burning mountains after their eruptions; and fometimes on the furface of the ferruginous matter which they throw out. This falt makes a very various appearance in many cafes; it is fometimes found in large and thick cakes, fometimes only in form of a thin powder, fcattered over the furface of the earth and ftones. Some of this falt is yellow, fome white, and fome greenifh. This falt is a concrete of nitre, fulphur, and vitriol, burnt and fublimed together; Borelli found once a vaft quantity of this falt on mount Ætna, and tried many experiments on it; from whence he concluded, that this falt is fo far from occafioning the explofions of that mountain, as fome have fuppofed, that it does not exift in it, but is formed during the burning. Phil. Tranf. N° 100.

ÆTOLARCHA, in Grecian antiquity, the principal magiftrate or governor of the Ætolians.

AFER (Domitius), a famous orator, born at Nifmes, flourifhed under Tiberius and the three fucceeding emperors. Quintilian makes frequent mention of him, and commends his pleadings. But he difgraced his talents, by turning informer againft fome of the moft diftinguifhed perfonages in Rome. Quintilian, in his youth, cultivated the friendfhip of Domitius very affiduoufly. He tells us that his pleadings abounded with pleafant ftories, and that there were public collections of his witty fayings, fome of which he quotes. He alfo mentions two books of his "*On Witneffes*." Domitius was once in great danger from an infcription he put upon a ftatue erected by him in honour of Caligula, wherein he declared that this prince was a fecond time a conful at the age of 27. This he intended as an encomium, but Caligula taking it as a farcafm upon his youth, and his infringement of the laws, raifed a procefs againft him, and pleaded himfelf in perfon. Domitius, inftead of making a defence, repeated part of the emperor's fpeech with the higheft marks of admiration; after which he fell upon his knees, and, begging pardon, declared, that he dreaded more the eloquence of Caligula than his imperial power. This piece of flattery fucceeded fo well, that the emperor not only pardoned, but alfo raifed him to the confulfhip. Afer died in the reign of Nero, A. D. 59.

AFFA, a weight ufed on the Gold Coaft of Guinea. It is equal to an ounce, and the half of it is called *eggeba*. Moft of the blacks on the Gold Coaft give thefe names to thofe weights.

AFFECTION, in a general fenfe, implies an attribute infeparable from its fubject. Thus magnitude, figure, weight, &c. are affections of all bodies; and love, fear, hatred, &c. are affections of the mind *.

Affection, fignifying *a fettled bent of mind toward a particular being or thing*, occupies a middle fpace between *difpofition* on the one hand, and *paffion* on the other †. It is diftinguifhable from Difpofition, which being a branch of one's nature, originally, muft exift before there can be an opportunity to exert it upon any particular object; whereas Affection can never be original, becaufe, having a fpecial relation to a particular object, it cannot exift till the object have once at leaft been prefented. It is alfo diftinguifhable from Paffion, which, depending on the real or ideal prefence of its object, vanifhes with its object: whereas Affection is a lafting connection; and, like other connections, fubfifts even when we do not think of the perfon. A familiar example will illuftrate this. There may be in one perfon's mind a difpofition to gratitude, which, through want of an object, happens never to be exerted; and which therefore is never difcovered even by the perfon himfelf. Another, who has the fame difpofition, meets with a kindly office that makes him grateful to his benefactor: An intimate connection is formed between them, termed *affection:* which, like other connections, has a permanent exiftence, though not always in view. The af-

* See *Moral Philofophy*, Part I. fec. i. iv.

† See *Difpofition*, and *Paffion*.

affection, for the most part, lies dormant, till an opportunity offer for exerting it: in that circumstance, it is converted into passion of gratitude; and the opportunity is eagerly seized of testifying gratitude in the warmest manner.

AFFECTION, among physicians, signifies the same as disease. Thus the hysteric *affection* is the same with the hysteric disease.

AFFERERS, or AFFERORS, in law, persons appointed in court-leets, courts-baron, &c. to settle, upon oath, the fines to be imposed upon those who have been guilty of faults arbitrarily punishable.

AFFETUOSO, or *Con Affetto*, in the Italian music, intimates that the part to which it is added ought to be played in a tender moving way, and consequently rather slow than fast.

AFFIANCE, in law, denotes the mutual plighting of troth between a man and woman to marry each other.

AFFIDAVIT, signifies an oath in writing, sworn before some person who is authorised to take the same.

AFFINITY, among civilians, implies a relation contracted by marriage; in contradistinction to consanguinity, or relation by blood.—Affinity does not found any real kinship; it is no more than a kind of fiction, introduced on account of the close relation between husband and wife. It is even said to cease when the cause of it ceases: hence a woman who is not capable of being a witness for her husband's brother during his lifetime, is allowed for a witness when a widow, by reason the affinity is dissolved. Yet with regard to the contracting marriage, affinity is not dissolved by death, though it be in every thing else.

There are several degrees of affinity, wherein marriage was prohibited by the law of Moses: thus, the son could not marry his mother, nor his father's wife (Lev. xviii. 7. et seq.): the brother could not marry his sister, whether she were so by the father only or by the mother only, and much less if she was his sister both by the same father and mother: the grandfather could not marry his grand-daughter, either by his son or daughter. No one could marry the daughter of his father's wife; nor the sister of his father or mother. Nor the uncle his niece; nor the aunt her nephew. Nor the nephew the wife of his uncle by the father's side. The father-in-law could not marry his daughter-in-law: nor the brother the wife of his brother, while living; nor even after the death of his brother, if he left children. If he left no children, the surviving brother was to raise up children to his deceased brother, by marrying his widow. It was forbidden to marry the mother and the daughter at one time, or the daughter of the mother's son, or the daughter of her daughter, or two sisters together. It is true the patriarchs before the law married their sisters, as Abraham married Sarah, who was his father's daughter by another mother; and two sisters together, as Jacob married Rachel and Leah; and their own sisters by both father and mother, as Seth and Cain. But these cases are not to be proposed as examples: because in some they were authorised by necessity; in others by custom; and the law as yet was not in being. If some other examples may be found, either before or since the law, the scripture expressly disapproves of them, as Reuben's incest with Balah his father's concubine, and the action of Ammon with his sister Tamar; and that of Herod-Antipas, who married Herodias his sister-in-law, his brother Philip's wife, while her husband was yet living.

AFFINITY is also used to denote conformity or agreement: Thus we say, the affinity of languages, the affinity of words, the affinity of sounds, &c.

AFFINITY, or ELECTIVE ATTRACTION, are terms used by modern chemists to express that peculiar propensity which different species of matter have to unite and combine with certain other bodies exclusively, or in preference to any other connection.

AFFIRMATION, in logic, the asserting the truth of any proposition.

AFFIRMATION, in law, denotes an indulgence allowed to the people called *Quakers;* who, in cases where an oath is required from others, may make a solemn affirmation that what they say is true; and if they make a false affirmation, they are subject to the penalties of perjury. But this relates only to oaths taken to the government, and on civil occasions; for Quakers are not permitted to give their testimony in any criminal case, &c.

AFFIRMATION is also used for the ratifying or confirming the sentence or decree of some inferior court: Thus we say, the house of lords affirmed the decree of the lord chancellor, or the decree of the lords of session.

AFFIRMATIVE, in grammar. Authors distinguish affirmative particles; such is, *yes*.—The term *affirmative* is sometimes also used substantively. Thus we say, the affirmative is the more probable side of the question: there were so many votes, or voices, for the affirmative.

AFFIX, in grammar, a particle added at the close of a word, either to diversify its form or alter its signification. We meet with *affixes* in the Saxon, the German, and other northern languages; but more especially in the Hebrew, and other oriental tongues. The Hebrew *affixes* are single syllables, frequently single letters, subjoined to nouns and verbs; and contribute not a little to the brevity of that language. The oriental languages are much the same as to the *radicals*, and differ chiefly from each other as to *affixes* and *prefixes*.

AFFLATUS, literally denotes a blast of wind, breath, or vapour, striking with force against another body. The word is Latin, formed from *ad* "to," and *flare* "to blow." Naturalists sometimes speak of the afflatus of serpents. Tully uses the word figuratively, for a divine inspiration; in which sense, he ascribes all great and eminent accomplishments to a divine afflatus. The Pythian priestess being placed on a tripod or perforated stool, over a holy cave, received the divine afflatus, as a late author expresses it, in her belly; and being thus inspired, fell into agitations, like a phrenetic; during which she pronounced, in hollow groans and broken sentences, the will of the deity. This afflatus is supposed, by some, to have been a subterraneous fume, or exhalation, wherewith the priestess was literally inspired. Accordingly, it had the effects of a real physical disease; the paroxysm of which was so vehement, that Plutarch observes it sometimes proved mortal. Van Dale supposes the pretended enthusiasm of the Pythia to have arisen from the fumes of aromatics.

AFFLICTION, is not itself, in propriety of medical

cal ſpeech, a diſeaſe, but it produces many: for whatever excites envy, anger, or hatred, produces diſeaſes from tenſe fibres; as whatever excites fear, grief, joy, or delight, begets diſeaſes from relaxation.

AFFORAGE, in the French cuſtoms, a duty paid to the lord of a diſtrict, for permiſſion to ſell wine, or other liquors, within his ſeignory. Afforage is alſo uſed for the rate or price of proviſions laid and fixed by the provoſt or ſheriffs of Paris.

AFFORESTING, Afforestatio, the turning ground into foreſt. The Conqueror, and his ſucceſſors, continued afforeſting the lands of the ſubject for many reigns; till the grievance became ſo notorious, that the people of all degrees and denominations were brought to ſue for relief; which was at length obtained, and commiſſions were granted to ſurvey and perambulate the foreſt, and ſeparate all the new afforeſted lands, and re-convert them to the uſes of their proprietors, under the name and quality of *purlieu* or *pouralle land*.

AFFRAY, or Affrayment, in law, formerly ſignified the crime of affrighting other perſons, by appearing in unuſual armour, brandiſhing a weapon, &c. but, at preſent, *affray* denotes a ſkirmiſh or fight between two or more.

AFFRONTEE, in heraldry, an appellation given to animals facing one another on an eſcutcheon; a kind of bearing which is otherwiſe called *confrontee*, and ſtands oppoſed to *adoſſee*.

AFFUSION, the act of pouring ſome fluid ſubſtance on another body. Dr Grew gives ſeveral experiments of the luctation ariſing from the affuſion of divers menſtruums on all ſorts of bodies. Divines and church hiſtorians ſpeak of baptiſm by affuſion; which amounts to much the ſame with what we now call *ſprinkling*.

AFRANIUS, a Latin poet, who wrote comedies in imitation of Menander, commended by Tully and Quintilian: he lived in the 170th olympiad.

AFRICA (according to Bochart, from a Punic word, ſignifying *Ears of Corn*); one of the four great diviſions, by the moderns called *quarters*, of the world, and one of the three called by the Greeks Ηπειροι, or *continents*. By them it was alſo called *Libya*.

Africa lies ſouth of Europe, and weſt of Aſia. It is bounded on the north by the Mediterranean, which ſeparates it from the former; on the north-eaſt, by the Red Sea, which divides it from Aſia, and to which it is attached by a neck of land called the *Iſthmus of Suez*, about 60 miles over, ſeparating the Mediterranean from the Red Sea. On the weſt, ſouth, and eaſt, it is bounded by the main ocean: ſo that it is properly a vaſt peninſula, bearing ſome faint reſemblance of a pyramid, the baſe of which is the northern part, running along the ſhores of the Mediterranean; and the top of the pyramid is the moſt ſoutherly point, called the *Cape of Good Hope*. Its greateſt length from north to ſouth is 4300 miles, and its greateſt breadth from eaſt to weſt is 3500 miles; reaching from Lat. 37° N. to 35° S. and from Long. 17° W. to 50° E.

Though the greateſt part of this continent hath been in all ages unknown both to the Europeans and Aſiatics, its ſituation is more favourable than either Europe or Aſia for maintaining an intercourſe with other nations. It ſtand, as it were, in the centre of the three other quarters of the globe; and has thereby a much nearer communication with Europe, Aſia, and America, than any one of theſe has with another. For, (1.) It is oppoſite to Europe in the Mediterranean, for almoſt 1000 miles in a line from eaſt to weſt; the diſtance ſeldom 100 miles, never 100 leagues, and ſometimes not above 20 leagues. (2.) It is oppoſite to Aſia for all the length of the Red Sea, the diſtance ſometimes not exceeding five leagues, ſeldom fifty. (3.) Its coaſt for the length of about 2000 miles lies oppoſite to America at the diſtance of from 500 to 700 leagues, including the iſlands: whereas America, unleſs where it may be a *terra incognita*, is no where nearer Europe than 1000 leagues; and Aſia, than 2500.

As the equator divides this continent almoſt in the middle, the far greateſt part of it is within the tropics; and of conſequence the heat in ſome places is almoſt inſupportable by Europeans, it being there greatly increaſed by vaſt deſerts of burning ſand.—It cannot be doubted, however, that, were the country well cultivated, it would be extremely fertile; and would produce in great abundance not only the neceſſaries, but alſo the luxuries, of life. It has been aſſerted, that the ſugars of Barbadoes and Jamaica, as alſo the ginger, cotton, rice, pepper, pimento, cocoa, indigo, &c. of theſe iſlands, would thrive in Africa to as much perfection as where they are now produced. Nor can it be doubted, that the Eaſt Indian ſpices, the tea of China and Japan, the coffee of Mocha, &c. would all thrive in ſome parts of the African coaſt; as this continent has the advantage of feeling no cold, the climate being either very warm or very temperate.

Whatever may be the caſe with the internal parts of Africa, it is certain that its coaſts are well watered with many very conſiderable rivers. The Nile and the Niger may be reckoned among the largeſt in any part of the world, America excepted. The firſt diſcharges itſelf into the Mediterranean, after a prodigious courſe from its ſource in Abyſſinia. The origin neither of the Nile, nor of the Niger, is certainly known; but that of the latter is ſuppoſed to run through a tract of land little leſs than 3000 miles. Both theſe rivers annually overflow their banks, fertilizing by that means the countries through which they paſs. The Gambia and Senegal rivers are only branches of the Niger. Many vaſt ridges of mountains alſo run through different parts of this continent; but their extent is very little known. Some of the moſt remarkable are, (1.) Thoſe called *Atlas*, lying between the 20th and 25th degree of north latitude, and ſuppoſed almoſt to divide the continent from eaſt to weſt. (2.) The *mountains of the moon*, ſo called on account of their great height; ſuppoſed to be the boundaries between Abyſſinia and ſome of the interior kingdoms. (3.) The mountains of *Sierra Leona*, ſo called on account of their abounding with lions, and likewiſe ſuppoſed to be the boundaries of ſome of the nations. (4.) Thoſe called by the ancients the *mountains of God*, on account of their being ſubject to perpetual thunder and lightning. Of all theſe, however, little more is known than their names.

To what we have already ſaid concerning the produce of Africa, we may add, that no part of the world abounds with gold and ſilver in a greater degree. Here alſo are a prodigious number of elephants; and it is ſurpriſing, that neither the ancient nor modern Europeans,

peans, notwithftanding their extravagant and infatiable thirft after gold and filver, fhould have endeavoured to eftablifh themfelves effectually in a country much nearer to them than either America or the Eaft Indies; and where the objects of their defire are found in equal, if not greater, plenty.

Next to gold and filver, copper is the moft valuable metal; and on this continent is found in great plenty, infomuch that the mountains of Atlas above mentioned are faid all to be compofed of copper ore. In fhort, Africa, though a full quarter of the globe, ftored with an inexhauftible treafure, and capable of producing almoft every neceffary, conveniency, and luxury of life, within itfelf, feems to be utterly neglected both by its own inhabitants and all other nations: the former, being in a favage ftate, are incapable of enjoying the bleffings offered them by nature; and the latter taking no farther notice of the inhabitants, or their land, than to obtain at the eafieft rate what they procure with as little trouble as poffible, or to carry them off for flaves to their plantations in America.

Only a fmall part of this continent was known to the ancients, *viz.* the kingdom of Egypt, and the northern coaft, comprehending little more than what is now known by the name of *Barbary*. It was divided into *Africa Propria*, and *Africa Interior*. Africa Propria comprehended only the Carthaginian territories. Africa Interior comprehended all other nations to the fouthward of thefe territories, or thofe at a greater diftance from Rome. The only kingdoms, however, with which the Romans had any connection, were the Numidians, the Mauritanians, and the Gætuli. All thefe, as well as Egypt, were fwallowed up by that enormous power, and reduced to the condition of Roman provinces. But the Romans never feem to have penetrated beyond the tropic of cancer. There appears, indeed, to have been fome intercourfe between them and the Ethiopians: but the latter always preferved their liberty; and we find their queen Candace mentioned in the times of the apoftles, when the Roman power was at its higheft pitch.

Between the tropic of cancer and the equinoctial line, a multitude of favage nations were fuppofed to have their refidence, known by the names of Melanogætuli, Nigritæ, Blemmyes, Dolopes, Aftacuri, Lotophagi, Ichthyophagi, Elephantophagi, &c. (which are taken notice of, as well as the others already mentioned, under their proper names); but that Africa was a peninfula, feems to have been totally unknown both to the Europeans and Afiatics for many ages.— It is probable indeed, that fome of the Phenicians, and their offspring the Carthaginians, were not fo ignorant; as they carried navigation to a much greater height than either the Greeks or Romans: but their difcoveries were all concealed with the greateft care, left other nations fhould reap the benefit of them; and accordingly we can now find no authentic accounts concerning them. The navigation round Africa, in particular, is recorded by the Greek and Roman writers rather as a ftrange amufing tale than as a real tranfaction; and as neither the progrefs of the Phenician and Carthaginian difcoveries, nor the extent of their navigation, were communicated to the reft of mankind, all memorials of their extraordinary fkill in naval affairs feem in a great meafure to have perifhed, when the maritime power of the former was annihilated by Alexander's conqueft of Tyre, and the empire of the latter was overturned by the Romans.

That the peninfula of Africa, however, was in reality failed round by the Phenicians, we have on indifputable authority; for fome of that nation undertook the voyage, at the command of Necho king of Egypt, about 604 years before the Chriftian æra. They failed from a port in the Red-fea, and after three years returned by the Mediterranean: and the very objections that were made to the veracity of their accounts at that time, are unanfwerable proofs to us that this voyage was really accomplifhed. They pretended, that, having failed for fome time, the fun became more and more vertical, after which he appeared in the north, and feemed to recede from them: that as they returned, the fun gradually feemed to move fouthwards; and, after becoming vertical once more, appeared then in the fouth fide of them as before they fet out. This, which we know muft certainly have been the cafe, was deemed incredible at that time, and univerfal ignorance concerning the extent of this continent prevailed till the 15th century. The firft attempts towards attaining a knowledge of Africa was made by the Portuguefe in 1412. Notwithftanding their vicinity, they had never ventured beyond Cape *Non*, fituated in about N. lat. 27°.: it had received its name from a fuppofed impoffibility of paffing it. This year they proceeded 160 miles farther, to Cape Bojador; which ftretching a confiderable way into the Atlantic ocean, with rocky clifts, appeared fo dreadful to the navigators, that they returned without any attempt to pafs it. In an attempt to double this formidable cape, they difcovered the Madeira iflands in 1419: but Cape Bojador continued to be the boundary of their continental difcoveries till 1433; when they penetrated within the tropics, and in a few years difcovered the river Senegal, Cape de Verd, and the iflands which lie off that promontory. In 1449, the weftern iflands, called the *Azores*, were difcovered: and in 1471, they firft penetrated beyond the line; and were furprifed to find, that the torrid zone, contrary to the opinion of the ancients, who imagined it to be burnt up with heat, was not only habitable, but fertile and populous. In 1484, they proceeded 1500 miles beyond the line; fo that they began to entertain hopes of finding that way a paffage to the Eaft Indies: and two years afterwards, the Cape of Good Hope was difcovered by Bartholomew de Diaz; but it was not till the year 1497, that the Portuguefe, under Vafquez de Gama, actually doubled this cape, and difcovered the true fhape of the continent. Thus the coafts of Africa were made perfectly known; and probably the knowledge concerning its interior parts would have been much greater than it is, had not the general attention been called off from this continent by the difcovery of America in 1492.

The Romans for a long time maintained their power in Africa: but in the year 426, Bonifacius, fupreme governor of all the Roman dominions in this quarter, being compelled to revolt by the treachery of another general called *Aetius*, and finding himfelf unable to contend with the whole ftrength of the Roman empire, called in Genferic king of the Vandals to his aid; who thereupon abandoned the provinces he had feized in Europe, and paffed over into Africa. Bonifacius, however,

Africa.

however, being soon after reconciled to his empress Placidia, endeavoured in vain to persuade the Vandals to retire. Hereupon a war ensued, in which the barbarians proved victorious, and quickly over-ran all the Roman provinces in Africa. In the year 435, a peace was concluded; when Numidia and some other countries were ceded to the Vandals, who soon after seized all the rest. These barbarians did not long enjoy their ill-gotten possessions: for, about the year 533, Belisarius drove them out, annexing the provinces to the eastern empire; and in 647, the Saracens, having conquered Mesopotamia, Egypt (which anciently was not included in the meaning of the word *Africa*), Phenicia, Arabia, and Palestine, broke like a torrent into Africa, which they quickly subdued. Their vast empire being in 936 divided into seven kingdoms, the African states retained their independency long after the others were subdued by the Turks: but in the beginning of the 16th century, being afraid of falling under the yoke of Spain, they invited the Turks to their assistance; who first protected, and then enslaved, them. They still continue in a kind of dependence on the Ottoman empire. They are not, however, properly speaking, the *subjects* of the grand Signior, but call him their *protector*, paying him an annual tribute. On the coasts, the natives are almost all addicted to piracy; and with such success have they carried on their employment, that the greatest powers in Europe are become their tributaries, in order to procure liberty to trade on the Mediterranean.

Concerning even those states which are nearest to Europe, very little is known: but the interior nations are scarce known by name; nor do almost any two of the most learned moderns agree in their division of Africa into kingdoms; and the reason is, that scarcely any traveller hath ever penetrated into these inhospitable regions, According to the best accounts, concerning those regions of Africa lying beyond Egypt and Barbary, they are divided in the following manner. On the western coast, to the south of Barbary, lie the kingdoms of Bildulgerid, Zaara, Negroland, Loango, Congo, Angola, Benguela, and Terra de Natal. On the eastern coast beyond Egypt, are those of Nubia, Adel, Ajan, Zanguebar (between these two a huge desart is interposed), Monomatapa, and Sofola. In the interior parts, the kingdoms of Lower Ethiopia, Abex, Monemuge, and Matanan, are made mention of. The southermost part, called Cafraria, is well known for the habitation of the Hottentots.

In many material circumstances, the inhabitants of this extensive continent agree with each other. If we except the people of Abyssinia, who are tawny, and profess a mixture of Christianity, Judaism, and Paganism, they are all of a black complexion. In their religion, except on the sea-coasts, which have been visited and settled by strangers, they are pagans; and the form of government is every where monarchical. Few princes, however, possess a very extensive jurisdiction; for as the natives of this part of Africa are grossly ignorant in all the arts of utility or refinement, they are little acquainted with one another; and generally united in small societies, each governed by its own prince. In Abyssinia, indeed, as well as in Congo, Loango, and Angola, we are told of powerful monarchs; but on examination, it is found that the authority of these princes stands on a precarious footing, each tribe or separate body of their subjects being under the influence of a petty chieftain of their own, styled *Negus*, to whose commands, however contrary to those of the Negascha Negascht, or king of kings, they are always ready to submit.

The fertility of a country so prodigiously extensive, might be supposed more various than we find it is: in fact, there is no medium in this part of Africa with regard to the advantages of soil; it is either perfectly barren or extremely fertile. This arises from the intense heat of the sun; which, where it meets with sufficient moisture, produces the utmost luxuriancy; and in those countries where there are few rivers, reduces the surface of the earth to a barren sand. Of this sort are the countries of Anian and Zaara; which, for want of water, and consequently of all other necessaries, are reduced to perfect deserts, as the name of the latter denotes. In those countries, on the other hand, where there is plenty of water, and particularly where the rivers overflow the land part of the year, as in Abyssinia, the productions of nature, both of the animal and vegetable kinds, are found in the highest perfection and greatest abundance. The countries of Mandingo, Ethiopia, Congo, Angola, Batua, Truticui, Monomotapa, Casati, and Mehenemugi, are extremely rich in gold and silver. The baser metals, likewise, are found in these and many other parts of Africa. But the persons of the natives make the most considerable article in the produce and traffic of this miserable quarter of the globe.

On the Guinea or western coast, the English trade to James Fort, and other settlements near and up the river Gambia; where they exchange their woollen and linen manufactures, their hardware, and spirituous liquors, for the persons of the natives. By the treaty of peace in 1783, the river of Senegal, with its dependencies, were given up to France. Gold and ivory, next to the slave trade, form the principal branches of African commerce. These are carried on from the same coast, where the Dutch and French, as well as English, have their settlements for this purpose.

The Portuguese are in possession of the east and west coast of Africa, from the Tropic of Capricorn to the Equator; which immense tract they became masters of by their successive attempts and happy discovery and navigation of the Cape of Good Hope. From the coast of Zanguebar, on the eastern side, they trade not only for the articles abovementioned, but likewise for several others; as sena, aloes, civet, ambergris, and frankincense. The Dutch have settlements towards the southern part of the continent, in the country called Caffraria, or the land of the Hottentots, particularly Cape Town, which is well settled and fortified; where their ships bound for India usually put in, and trade with the natives for their cattle, in exchange for which they give them spirituous liquors.

The Portuguese being sovereigns of the greatest part of the coast, have a number of black princes their tributaries. There are some independent princes who have extensive dominions; particularly the kings of Dahome and Widah, the most noted of any for the infamous slave trade. Upwards of 200 years have the European nations traded with Africa in human flesh; and encouraged in the Negro countries, wars, rapine, desolation,

desolation, and murder, that the West India islands might be supplied with that commodity. The annual exportation of poor creatures from Africa for slaves hath exceeded 100,000; numbers of whom are driven down like sheep, perhaps a 1000 miles from the sea-coast, who are generally inhabitants of villages that have been surrounded in the night by armed force, and carried off to be sold to our traders.—Nor do our planters, who purchase them, use any pains to instruct them in religion, to make them amends for the oppression thus exercised on them. It is said they are unnaturally averse to every thing that tends to it; yet the Portuguese, French, and Spaniards, in their settlements, succeed in their attempts to instruct them, as much to the advantage of the commerce as of religion. It is for the sake of Christianity, and the advantages accompanying it, that English slaves embrace every occasion of deserting to the settlements of these nations.—But upon this subject the feelings and reflection of the nation have of late been abundantly roused, and in the investigation of it the wisdom of the legislature is soon to be employed.

AFRICAN Company, a society of merchants, established by King Charles II. for trading to Africa; which trade is now laid open to all his Majesty's subjects, paying 10 *per cent.* for maintaining the forts.

AFRICANUS (Julius), an excellent historian of the third century, the author of a chronicle which was greatly esteemed, and in which he reckons 5500 years from the creation of the world to Julius Cæsar. This work, of which we have now no more than what is to be found in Eusebius, ended at the 221st year of the vulgar æra. Africanus also wrote a letter to Origen on the history of Susanna, which he reckoned suppositititious; and we have still a letter of his to Aristides, in which he reconciles the seeming contradictions in the two genealogies of Christ recorded by St Matthew and St Luke.

AFSLAGERS, persons appointed by the burgomasters of Amsterdam to preside over the public sales made in that city. They must always have a clerk of the secretary's office with them, to take an account of the sale. They correspond to our brokers, or auctioneers.

AFT, in the sea language, the same with abaft.

AFTERBIRTH, in midwifery, signifies the membranes which surround the infant in the womb, generally called the secundines. See Midwifery.

AFTERMATH, in husbandry, signifies the grass which springs or grows up after mowing.

AFTERNOON, the latter half of the artificial day, or that space between noon and night.

AFTER-PAINS, in midwifery, excessive pains felt in the groin, loins, &c. after the woman is delivered.

AFTER-SWARMS, in the management of bees, are those which leave the hive some time after the first has swarmed. See Bee.

AFWESTAD, a large copper-work belonging to the crown of Sweden, which lies on the Dala, in the province of Dalecarlia, in Sweden. It looks like a town, and has its own church. Here they make copper-plates; and have a mint for small silver coin, as well as a royal post-house. W. Long. 14. 10. N. Lat. 58. 10.

AGA, in the turkish language, signifies a great lord or commander. Hence the aga of the Janissaries is the commander in chief of that corps; as the general of horse is denominated *spahiclar aga*. The aga of the Janissaries is an officer of great importance. He is the only person who is allowed to appear before the Grand Signior without his arms across his breast in the posture of a slave. Eunuchs at Constantinople are in possession of most of the principal posts of the seraglio: The title *aga* is given to them all, whether in employment or out. This title is also given to all such men without employ, and especially to wealthy landholders.

We find also *agas* in other countries. The chief officers under the Khan of Tartary are called by this name. And among the Algerines, we read of *agas* chosen from among the *boluk bashis* (the first rank of military officers), and sent to govern in chief the towns and garrisons of that state. The *aga* of Algiers is the president of the divan, or senate. For some years, the *aga* was the supreme officer; and governed the state in the place of bashaw, whose power dwindled to a shadow. But the soldiery rising against the *boluk bashis*, or *agas*, massacred most of them, and transferred the sovereign power to the calif, with the title of *Dey* or King.

AGADES, a kingdom and city of Negroland in Africa. It lies nearly under the tropic of Cancer, between Gubur and Cano. The town stands on a river that falls into the Niger; it is walled, and the king's palace is in the midst of it. The king has a retinue, who serve as a guard. The inhabitants are not so black as other negroes, and consist of merchants and artificers. Those that inhabit the fields are shepherds or herdsmen, whose cottages are made of boughs, and are carried about from placc to place on the back of oxen. They are fixed on the spot of ground where they intend to feed their cattle. The houses in the city are stately, and built after the Barbary fashion. This kingdom was, and may be still, tributary to the king of Tombut. It is well watered; and there is great plenty of grass, cattle, senna, and manna. The prevailing religion is the Mahometan, but very loosely professed. N. Lat. 26. 10. E. Long. 9. 10.

AGALLOCHUM. See Xylo Aloes.

AGALMATA, in antiquity, a term originally used to signify any kind of ornaments in a temple; but afterwards for the statutes only, as being most conspicuous.

AGAMEMNON, the son of Atreus by Erope, was captain-general of the Trojan expedition. It was foretold to him by Cassandra, that his wife Clytemnestra would be his death: yet he returned to her; and accordingly was slain by Ægisthus, who had gained upon his wife in his absence, and by her means got the government into his own hands.

AGANIPPIDES, in ancient poetry, a designation given to the muses, from a fountain of mount Helicon, called *Aganippe*.

AGANIPPE, in antiquity, a fountain of Bœotia at mount Helicon, on the borders between Phocis and Bœotia, sacred to the muses, and running into the river Permesseus; (Pliny, Pausanias.) Ovid seems to make *Aganippe* and *Hippocrene* the same. Solinus more truly distinguishes them, and ascribes the blending them to poetical licemse.

AGAPE, in ecclesiastical history, the love-feast, or feast of charity, in use among the primitive Christans; when

Plate III.

Africa.
ATLANTIC OCEAN
MEDITERRANEAN SEA
BARBARY
Morocco
SARA or the Twargbes
DESART
NEGROLAND
GUINEA
ETHIOPIA
ABISSINIA
Nubia
EGYPT
ASIA
ARABIA
ARABIA FELIX
RED SEA
Tropic of Cancer
The Equinoctial Line
ETHIOPIC OCEAN
Meridian of London
MONOMOTAPA
ZANGUEBAR
Hottentots
MADAGASCAR
SOUTHERN OCEAN
EASTERN OCEAN
Tropic of Capricorn
Pt. OF SOUTH AMERICA
BRASIL
Longitude from London
C.of Good Hope
Str.of Gibraltar
Jerusalem
Persian Gulf
C.Verd Isles
St. Helena
Ascension
Almirante I.
A. Bell Sculpt.

Agapetæ, Agard.

when a liberal contribution was made by the rich to feed the poor. The word is Greek, and fignifies *love*. St Chryfoftom gives the following account of this feaft, which he derives from the apoftolical practice. He fays, "the firft Chriftians had all things in common, as we read in the Acts of the Apoftles; but when that equality of poffeffions ceafed, as it did even in the Apoftles time, the agape, or love-feaft, was fubftituted in the room of it. Upon certain days, after partaking of the Lord's fupper, they met at a common feaft; the rich bringing provifions, and the poor who had nothing being invited." It was always attended with receiving the holy facrament; but there is fome difference between the ancient and modern interpreters as to the circumftance of time, viz. Whether this feaft was held before or after the communion. St Chryfoftom is of the latter opinion; the learned Dr Cave of the former.—Thefe love-feafts, during the three firft centuries, were held in the church without fcandel or offence; but, in after times, the heathens began to tax them with impurity. This gave occafion to a reformation of thefe *agapæ*. The kifs of charity, with which the ceremony ufed to end, was no longer given between different fexes; and it was exprefsly forbidden to have any beds or couches, for the conveniency of thofe who fhould be difpofed to eat more at their eafe. Notwithftanding thefe precautions, the abufes committed in them became fo notorious, that the holding of them (in churches at leaft) was folemnly condemned, at the council of Carthage, in the year 397.

AGAPETÆ, in ecclefiaftical hiftory, a name given to certain virgins and widows, who, in the ancient church, affociated themfelves with, and attended on, ecclefiaftics, out of a motive of piety and charity.

In the primitive days there were women inftituted Deaconesses; who, devoting themfelves to the fervice of the church, took up their abode with the minifters, and affifted them in their functions. In the fervour of the primitive piety, there was nothing fcandalous in thefe focieties: but they afterwards degenerated into libertinifm; infomuch, that St Jerom afks, with indignation, *unde agapetarum peftis in ecclefias introiit?* This gave occafion to councils to fupprefs them.—St Athanafius mentions a prieft, named Leontius, who, to remove all occafion of fufpicion, offered to mutilate himfelf, to preferve his beloved companion.

AGARD (Arthur), a learned Englifh antiquarian, born at Tofton in Derbyfhire in the year 1540. His fondnefs for Englifh antiquities induced him to make many large collections; and his office as deputy chamberlain of the exchequer, which he held 45 years, gave him great opportunities of acquiring fkill in that ftudy. Similarity of tafte brought him acquainted with Sir Robert Cotton, and other learned men, who affociated themfelves under the name of *The Society of Antiquarians*, of which fociety Mr Agard was a confpicuous member. He made the doomfday-book his peculiar ftudy; and compofed a work purpofely to explain it, under the title of *Tractatus de ufu et obfcurioribus verbis libri de Domefday:* he alfo compiled a book for the fervice of his fucceffors in office, which he depofited with the officers of the king's receipt, as a proper index for fucceeding officers. All the reft of his collections, containing at leaft twenty volumes, he bequeathed to Sir Robert Cotton; and died in 1615.

Agaric, Agaricus.

AGARIC. See Agaricus.

Female Agaric. See Boletus.

Mineral Agaric, a marley earth refembling the vegetable of that name in colour and texture. It is found in the fiffures of rocks, and on the roofs of caverns; and is fometimes ufed as an aftringent in fluxes, hemorrhagies, &c.

AGARICUS, or Mushroom, a genus of the order of fungi, belonging to the cryptogamia clafs of plants.

Species and ufes. Botanical writers enumerate 55 fpecies belonging to this genus; of which the moft remarkable are the following.

1. The campeftris, or common mufhroom, has the top or cap firft of a dirty cream colour, convex, and, if but juft expanding, the under part, or what is called the *gills*, is of a bright flefh red: this colour lafts but a little time before it turns darker; and when the plant is old, or has been fome time expanded, the gills become of a dark brown, the cap almoft flat, of a dirty colour, and often a little fcaly. It differs much in fize in different plants, it being from an inch to feven inches broad. The general ufe of it is well known. It is found in woods, old paftures, and by road-fides, and is in the greateft perfection in September. There is a variety of this with a yellowifh white cap and white gills; this is very firm, but feldom expands fo freely as the true fort, and when broiled will exude a yellowifh juice. It is probable this fort is not pernicious, though it is always rejected by fuch as can diftinguifh it.

2. The pratenfis, or *champignion*, is very common upon heaths and dry paftures. A number of them generally come up in a place, ranged in curved lines or circles. The cap is fmall, almoft flat, from one to two or three inches diameter, of a pale buff colour, often crimpled at the edges, and, when dry, tough like leather or a thin piece of fine cork. The gills are of the colour of the cap; are thinly placed; with a fhort one, and fometimes two, coming from the edge of the cap between each. The ftalk or pillar is alfo of the colour of the cap; it is long, flender, and all the way of a thicknefs. This plant has but little fmell; is rather dry; and yet, when broiled or ftewed, it communicates a good flavour. In perfection at the fame time with the former.

3. The chantarellus, or *chantarelle agaric*, is rather a fmaller fungus than the former. The cap is yellow, of different hues in different plants, fome being of a pale yellow, and others of an orange colour. It is generally funk in the middle, fomewhat refembling a tunnel, and its edges are often twifted and contorted fo as to form finufes or angles. The gills are of a deeper colour than the outfide, are very fine, even, numerous, and beautifully branched. The ramifications begin at the ftalk, and are varioufly extended towards the edge of the cap. The pillar is of the fame colour as the cap, is feldom inferted in the centre, but rather fideways; it is fhort, thickifh at the root, and the gills moftly run down the top, which make it appear fmalleft in the middle. This plant broiled with falt and pepper has much the flavour of a roafted cockle; and is efteemed a delicacy by the French, as is the former. It is found in woods and high paftures, and is in perfection about the end of September.

4. The deliciofus, or orange agaric. The general fize

Agaricus. size of the cap of this species is from two to four inches broad. Its form is circular, with the edges bent inwards; convex on the upper surface, except in the centre, where it is a little depressed, so as nearly to resemble the apex of a smooth apple. The colour is a sordid yellow, streaked with ash and yellowish brown, from the centre to the edge, and when it is broken it emits a gold-colour juice. The gills are of a deep yellow, and a few of them come out by pairs at the stalk, but divide immediately, and run straight to the edge of the cap. The stalk or pillar is thinnest near the middle, thickest at the root, and when cut transversely, it is quite white in the centre, with a fine yellow ring that goes to the edge. This fungus, well seasoned and then broiled, has the exact flavour of a roasted muscle. Its prime time is September, and it is to be found in high dry woods.

5. The cinnamomeus, or brown mushroom, has a cap the colour of fresh-tanned hides. At first it is hemispherical, firm, even, and fleshy, with mostly a small rising in the centre; but when old it is quite flat. The gills are of a yellowish brown, not very distant from each other, bent like a knee at the pillar, and have a short one or two run from the edge of the cape between each. The pillar is near the length of a finger, firm, rather thick, brown at the base, of a sordid yellow upward, and, when cut transversely, of a fine white grain. The cap in different plants is from two to five inches broad. The whole plant has a pleasant smell, and when broiled gives a good flavour. It is found in woods in September and October.

6. The violaceus, or violet mushroom. Its cap, when first expanded, is smooth, hemispherical, the main surface of a livid colour, but towards the margin it is of a better blue. When full grown or old, it becomes corrugated, and of a rusty brown. The gills of a young plant are of a beautiful violet colour, and regularly placed. The pillar is of the colour of the gills, short, of a conical form, but swelled at the base into a sort of bulb. Its upper part is surrounded with an iron-coloured wool, which, in a plant just expanding, stretches cross to the edge of the cap like a web. This species requires much broiling; but when sufficiently done and seasoned, it is as delicious as an oyster. It is found in woods in October. Hudson's bulbosus is only a variety of this plant.

The above are the only species that can be safely recommended as edible: though there are some other sorts which are frequently eaten by the country people; and it is probable the greatest part of those with firm fleshy caps might be eaten with safety, provided they were chosen from dry grounds. It is well known that soil and situation have a great influence upon the properties of plants; and these being of a singular nature, and absolutely between that of an animal and vegetable, may be more powerfully affected than a complete species of either, by reason they have neither leaves nor branches to carry off the noxious damps and vapours of a stagnant soil, as a perfect vegetable has; nor have they any gross excremental discharges, like those of a living animal. The gills no doubt do exhale some of their superfluous moisture; but their situation is such, that any thick steam from the earth may lodge in them, and by clogging their excretory ducts, render the plants morbid. Thus they soon run into a state of putrefaction, and become a prey to worms, flies, and other insects. The common mushroom, which is in general esteem (though we have several others better) is not safely eaten when produced upon a moist soil. Those who gather mushrooms for sale should therefore have particular regard to the lands they collect them from, especially if they know they are to broiled; but if they be intended for catchup, perhaps they may be less cautious, as the salt and spices with which the juice is boiled may correct any evil disposition in the plants. But, even in this case, catchup made of mushrooms taken from a dry soil has a more aromatic and pleasant flavour than that which is made of those taken from a moist one, and it will always keep a great deal better. Agaricus.

Of the poisonous sorts, the two following are the most singular:

7. The muscarius, or reddish mushroom, has a large hat almost flat, either white, red, or crimson, sometimes beset with angular red warts; the gills are white, flat, and inversely spear-shaped; the pillar is hollow, the cap fixed to the middle of the pillar, limber, and hanging down. This species grows in pastures, and is said to destroy bugs effectually if the juice is rubbed upon the walls and bed-posts. The inhabitants of the north of Europe, whose houses are greatly infested with flies at the decline of summer, infuse it in milk, and set it in their windows, and the flies upon tasting the least drop are instantly poisoned. An infusion of common pepper in milk answers the same purpose: but the flies through time become wise enough not to taste it; and though vast numbers are at first destroyed, it is impossible to clear a house of these insects by this means.—This is the *moucho-more* of the Russians, Kamtschadales, and Koriacs, who use it as an instrument of intoxication. They sometimes eat it dry, sometimes immersed in a fermented liquor made with the epilobium, which they drink notwithstanding the dreadful effects. They are first seized with convulsions in all their limbs, then with a raving such as attends a burning fever. A thousand phantoms, gay or gloomy (according to their constitutions), present themselves to their imaginations: some dance, others are seized with unspeakable horrors. They personify this mushroom; and, if its effects urge them to suicide, or any dreadful crime, they say they obey its commands. To fit themselves for premeditated assassinations, they take the mouchomore. Such is the fascination of drunkenness among these people, that nothing can induce them to forbear this dreadful potion!

8. The clypeatus, or long-stalked mushroom, has an hemispherical hat tapering to a point, and clammy; the pillar is long, cylindrical, and white; the gills are white, and not concave, dusted with a fine powdery substance on each side; the root is bulbous, long, and hooked at the end. It is found in September, in woodlands and pastures. This species is thought to be poisonous; and we have the following account of the symptoms produced by eating it, in Dr Percival's Essays. "Robert Usherwood, of Middleton, near Manchester, a strong healthy man, aged 50 years, early in the morning gathered and eat what he supposed to be a mushroom. He felt no symptoms of indisposition, till five o'clock in the evening; when, being very thirsty, he drank near a quart of table-beer. Soon afterwards he became universally swoln, was sick, and in great agonies. A severe vomiting and purging succeeded,

succeeded, with violent cramps in his legs and thighs. He discharged several pieces of the fungus, but with little or no relief. His pains and evacuations continued, almost without intermission, till the next night; when he fell into a sound sleep, and awaked in the morning perfectly easy, and free from complaint."

Many of the different species of this genus grow on cows or horses dung, on dunghills, on rotten wood, in cellars, or on the trunks of trees; of which the most remarkable is,

9. The quercinus, or agaric of the oak. This is of various sizes, sometimes not exceeding the bigness of the fist, sometimes as large as a man's head. It takes at least an year or two to grow to its full size. It is dark coloured, hard, heavy, and woody; it is sometimes used by the dyers, as an ingredient in the black dye. It tastes at first sweetish in the mouth, but presently becomes very bitter and nauseous. It was formerly an article in the Materia Medica; but is now deservedly rejected from our pharmacopæias.

Culture. Only the esculent kinds of mushrooms are cultivated; and the following method is used by the gardeners who raise them for sale.—If the young mushrooms cannot be procured from gardens, they must be looked for in rich pastures during the months of August and September: the ground must be opened about their roots, where it is frequently found full of small white knots; which are the off-sets, or young mushrooms. These must be carefully gathered in lumps, with the earth about them: but as this spawn cannot be found in the pasture, except at that season when the mushrooms are naturally produced, it may be searched for at any time in old dung-hills, especially where there has been much litter, and it hath not been penetrated by wet so as to rot: it may also be found very often in old hot-beds; or it may be procured by mixing some long dung from the stable, which has not been thrown on a heap to ferment, with strong earth, and put under cover to prevent wet getting to it. The spawn commonly appears in about two months after the mixture is made; but proportionably sooner the more effectually the air is excluded, provided the mixture is not kept so close as to heat. Old thatch, or litter which has lain long abroad so as not to ferment, is the best covering. The spawn has the appearance of white mould shooting out into long strings, by which it may be easily known wherever it is met with.—The beds for receiving the spawn are now to be prepared. These should be made of dung in which there is plenty of litter, but which should not be thrown on a heap to ferment: that dung which has lain spread abroad for a month or longer is best. The beds should be made on dry ground, and the dung laid on the surface; the width at the bottom should be two and a half or three feet, the length in proportion to the quantity of mushrooms desired; then lay the dung about a foot thick, covering it with strong earth about four inches deep. Upon this lay more dung, about 10 inches thick; then another layer of earth, still drawing in the sides of the bed, so as to form it like the roof of a house; which may be done by three layers of dung, and as many of earth. When the bed is finished, it must be covered with litter or old thatch, both to prevent its drying too fast and to keep out wet. In this situation it ought to remain eight or ten days, when it will be in a proper temperature to receive the spawn; for this is destroyed by too much heat; though, before planting, it may be kept very dry, not only without detriment, but with considerable advantage.—The bed being in a proper temperature for the spawn, the covering of litter should be taken off, and the sides of the bed smoothed; then a covering of light rich earth, about an inch thick, should be laid all over the bed; but this should not be wet. Upon this the spawn must be thrust, laying the lumps two or three inches asunder: then gently cover this with the same light earth, above half an inch thick; and put the covering of litter over the bed, laying it so thick as to keep out wet, and prevent the bed from drying. In spring or autumn the mushrooms will begin to appear, perhaps in a month after making; but when the beds are made in summer or winter, they are much longer before they produce. In any season, however, they ought not to be hastily destroyed; since mushroom-beds have been known to produce very plentifully, even after the spawn has lain in them five or six months. When the beds are destroyed, the spawn should be carefully preserved, and laid up in a dry place, at least five or six weeks before it is again planted.—The difficulty of managing mushrom-beds is, to keep them always in a proper degree of moisture. In the summer season they may be uncovered to receive gentle showers of rain at proper times; and in long dry seasons the beds should now and then be watered, but much wet ought by no means to be suffered to come to them. During the winter season they must be kept as dry as possible, and so closely covered as to keep out cold. In frosty, or very cold weather, if some warm litter, shaken out of a dung-heap, is laid on, the growth of the mushrooms will be promoted: but betwixt this and the bed, a covering of dry litter must be interposed; which should be renewed as it decays; and, as the cold increases, the covering must be thickened. By attending to these directions, plenty of mushrooms may be produced all the year round. One bed will continue good for many months. For a peculiar, perhaps fabulous, method of producing mushrooms, see the article LYNCURIUS.

Physicians have disputed much about the qualities of mushrooms; some considering them as a rich nourishment, and perfectly innocent, when properly chosen; and others asserting them to be extremely deleterious. Most of the fungi are indeed of a hurtful quality; and, with respect to the whole tribe, the esculent are very few. Esculent mushrooms are very nutritive, very readily alkalescent, and more so without intermediate acescency than any other vegetable: they are therefore a rich nourishment, and much akin to animal food; on which account they may be indulged in considerable quantity to strong persons. It requires, however, skill to distinguish this esculent kind; and very few, especially of those who are commonly employed to gather them, viz. the servants, have studied Clusius, or other authors who have been at the pains to distinguish them. Perhaps our esculent mushrooms, if old, acquire a dangerous acrimony; and for these reasons Dr Cullen is of opinion that it is for the most part prudent to avoid them. In the warmer climates they may be used as light food; but here it is preposterous to use them along with animal food, as they do not correct its alkaline tendency.

AGATE,

Agate.

AGATE, or ACHAT, (among the Greeks and Latins, Αχατης, and *Achates*, from a river in Sicily, on the banks of which it was firſt found), a very extenſive genus of the ſemipellucid gems.

Theſe ſtones are variegated with veins and clouds, but have no zones like thoſe of the onyx. They are compoſed of chryſtal debaſed by a large quantity of earth, and not formed, either by repeated incruſtations round a central nucleus, or made up of plates laid evenly on one another; but are merely the effect of one ſimple concretion, and variegated only by the diſpoſition given, by the fluid they were formed in, to their differently coloured veins or matters.

Agates are arranged according to the different colours of their ground. Of thoſe with a *white* ground there are three ſpecies. (1.) The *dendrachates*, *mocoa ſtone*, or *aboreſcent agat*. This ſeems to be the ſame with what ſome authors call the achates with roſemary in the middle, and others achates with little branches of black leaves. (2.) The *dull, milky-looking agate*. This, though greatly inferior to the former, is yet a very beautiful ſtone. It is common on the ſhores of rivers in the Eaſt Indies, and alſo in Germany and ſome other parts of Europe. Our lapidaries cut it into counters for card-playing, and other toys of ſmall value. (3.) The *lead-coloured agate*, called the *phaſſachates* by the ancients.

Of the agates with a *reddiſh* ground there are four ſpecies. (1.) An impure one of a fleſh-coloured white, which is but of little beauty in compariſon with other agates. The admixture of fleſh-colour is but very ſlight; and it is often found without any clouds, veins, or other variegations; but ſometimes it is prettily veined or variegated with ſpots of irregular figures, having fimbriated edges. It is found in Germany, Italy, and ſome other parts of Europe; and is wrought into toys of ſmall value, and often into the German gunflints. It has been ſometimes found with evident ſpecimens of the perfect moſſes bedded deep in it. (2.) That of a pure blood colour, called *hæmachates*, or the *bloody agate*, by the ancients. (3.) The clouded and ſpotted agate, of a pale fleſh colour, called by the ancients the *carnelian agate*, or *ſardachates*. 4. The red-lead-coloured one, variegated with yellow, called the *coral agate*, or *coralla-achates*, by the ancients.

Of the agates with a *yellowiſh* ground there are only two known ſpecies; the one of the colour of yellow wax, called *cerachates* by the ancients; the other a very elegant ſtone, of a yellow ground, variegated with white, black, and green, called the *leonina*, and *leonteſeres* by the ancients.

Laſtly, Of the agates with a *greeniſh* ground, there is only one known ſpecies, called by the ancients *jaſpachates*.

Of all theſe ſpecies there are a great many varieties; ſome of them having upon them natural repreſentations of men and different kinds of animals, &c. Theſe repreſentations are not confined to the agates whoſe ground is of any particular colour, but are occaſionally found on all the different ſpecies. Velſchius had in his cuſtody a fleſh-coloured agate, on one ſide of which appeared a half-moon in great perfection, repreſented by a milky ſemicircle; on the other ſide, the phaſes of *veſper*, or the evening-ſtar; whence he denominated it an *aphrodiſian agate*. An agate is mentioned by Kircher *, on which was the repreſentation of a heroine armed; and one in the church of St Mark in Venice has the repreſentation of a king's head adorned with a diadem. On another, in the muſæum of the prince of Gonzaga, was repreſented the body of a man with all his clothes in a running poſture. A ſtill more curious one is mentioned by de Boot †, wherein appears a circle ſtruck in brown, as exactly as if done with a pair of compaſſes, and in the middle of the circle the exact figure of a biſhop with a mitre on: but inverting the ſtone a little, another figure appears; and if it is turned yet further, two others appear, the one of a man, and the other of a woman. But the moſt celebrated agate of this kind is that of Pyrrhus, wherein were repreſented the nine muſes, each with their proper attributes, and Apollo in the middle playing on the harp ‡. In the emperor's cabinet is an oriental agate of a ſurpriſing bigneſs, being faſhioned into a cup, whoſe diameter is an ell, abating two inches. In the cavity is found delineated in black ſpecks, B. XRISTOR. S. XXX. Other agates have alſo been found, repreſenting the numbers 4191, 191; whence they were called *arithmetical* agates, as thoſe repreſenting men or women have obtained the name of *anthropomorphous*.

* Ephem. German. dec. i. an. 1. obſ. 151.

† De Gem. l. ii. c. 95.

‡ Pliny, l. xxxvii. c. 3.

Great medicinal virtues were formerly attributed to the agate, ſuch as reſiſting poiſons, eſpecially thoſe of the viper, ſcorpion, and ſpider; but they are now very juſtly rejected from medicinal practice. The oriental ones are all ſaid to be brought from the river Gambay. A mine of agates was ſome time ago diſcovered in Tranſylvania, of divers colours; and ſome of a large ſize, weighing ſeveral pounds.

Agates may be ſtained artificially with ſolution of ſilver in ſpirit of nitre, and afterwards expoſing the part to the ſun; and though theſe artificial colours diſappear on laying the ſtone for a night in aquafortis, yet a knowledge of the practicability of thus ſtaining agates, muſt render thoſe curious figures above-mentioned ſtrongly ſuſpected of being the work not of nature, but of art. Some account for theſe phenomena from natural cauſes. Thus, Kircher, who had ſeen a ſtone of this kind in which were depicted the four letters uſually inſcribed on crucifixes, I. N. R. I. apprehends that ſome real crucifix had been buried under-ground, amnog ſtones and other rubbiſh, where the inſcription happening to be parted from the croſs, and to be received among a ſoft mould or clay ſuſceptible of the impreſſion of the letters, came afterwards to be petrified. In the ſame manner he ſuppoſes the agate of Pyrrhus to have been formed. Others reſolve much of the wonder into fancy, and ſuppoſe thoſe ſtones formed in the ſame manner with the *camieux* * or Florentine ſtones.

* See *Camieux*.

The agate is uſed for making cups, rings, ſeals, handles for knives and forks, hilts for ſwords and hangers, beads to pray with, ſmelling boxes, patch-boxes, &c. being cut or ſawed with no great difficulty. At Paris, none have a right to deal in this commodity except the wholeſale mercers and goldſmiths. The ſword-cutlers are allowed to ſell it, but only when made into handles for couteaux de chaſſe, and ready ſet in. The cutlers have the ſame privilege for their knives and forks.

Conſiderable quantities of theſe ſtones are ſtill found near the river Achates in Sicily. There are found in ſome of theſe the ſurpriſing repreſentations above-men-

Agate || Agathias.

mentioned, or others ſimilar to them. By a dexterous management of theſe natural ſtains, medals have been produced, which ſeem maſter-pieces of nature: for this ſtone bears the graver well; and as pieces of all magnitudes are found of it, they make all ſorts of work of it. The high altar of the cathedral of Meſſina is all over encruſted with it. The lapidaries pretend that the Indian agates are finer than the Sicilian; but Father Labat * informs us, that in the ſame quarries, and even in the ſame block, there are found pieces much finer than others, and theſe fine pieces are ſold for Indian agates in order to enhance their price.

* Voyage d'Ital. tom. v. p. 156.

Agate, among antiquaries, denotes a ſtone of this kind engraven by art. In this ſenſe, agates make a ſpecies of antique gems; in the workmanſhip whereof we find eminent proofs of the great ſkill and dexterity of the ſculptors. Several agates of exquiſite beauty are preſerved in the cabinets of the curious; but the facts or hiſtories repreſented on theſe antique agates, however well executed, are now become ſo obſcure, and their explications ſo difficult, that ſeveral diverting miſtakes and diſputes have ariſen among thoſe who undertook to give their true meaning.

The great agate of the apotheoſis of Auguſtus, in the treaſury of the holy chapel, when ſent from Conſtantinople to St Lewis, paſſed for a triumph of Joſeph. An agate, now in the French king's cabinet, had been kept 700 years with great devotion, in the Benedictine abbey of St Evre at Toul, where it paſſed for St John the Evangeliſt carried away by an eagle, and crowned by an angel; but the Heatheniſm of it having been lately detected, the religious would no longer give it a place among their relicts, but preſented it in 1684 to the king. The antiquaries found it to be the apotheoſis of Germanicus. In like manner the triumph of Joſeph was found to be a repreſentation of Germanicus and Agrippina, under the figures of Ceres and Triptolemus. Another was preſerved, from time immemorial, in one of the moſt ancient churches of France, where it had paſſed for a repreſentation of paradiſe and the fall of man; there being found on it two figures repreſenting Adam and Eve, with a tree, a ſerpent, and a Hebrew inſcription round it, taken from the third chapter of Geneſis, "The woman ſaw that the tree was good," &c. The French academiſts, inſtead of our firſt parents, found Jupiter and Minerva repreſented by the two figures: the inſcription was of a modern date, written in a Rabbinical character, very incorrect, and poorly engraven. The prevailing opinion was, that this agate repreſented ſimply the worſhip of Jupiter and Minerva at Athens.

Hiſt. Acad. R. Inſcript. tom. i. p. 337—344

Agate, is alſo a name of an inſtrument uſed by gold-wire-drawers; ſo called from the agate in the middle of it, which forms its principal part.

AGATHIAS, or, as he calls himſelf in his epigrams, Agathius, diſtinguiſhed by the title of *Scholaſticus*, a Greek hiſtorian in the 6th century under Juſtinian. He was born at Myrina, a colony of the ancient Æolians, in Aſia the leſs, at the mouth of the river Phythicus. He was an advocate at Smyrna. Tho' he had a taſte for poetry, he was yet more famous for his hiſtory, which begins with the 26th year of Juſtinian's reign, where Procopius ends. It was printed in Greek and Latin, with Bonaventure Vulcanius's, at Leyden, 1594, in 4to; and in Paris at the king's printing-houſe, 1660, in folio.

Agatho || Agave.

AGATHO, a tragic and comic poet, diſciple to Prodicus and Socrates, applauded in Plato's Dialogues for his virtue and beauty. His firſt tragedy obtained the prize; and he was crowned in the preſence of upwards of 30,000 men, the 4th year of the 90th Olympiad. There is nothing now extant of his, except a few quotations in Ariſtotle, Athenæus, and others.

AGATHOCLES, the famous tyrant of Sicily, was ſon of a potter at Reggio. He was a thief, a common ſoldier, a centurion, a general, and a pirate, all in a regular ſucceſſion. He defeated the Carthaginians ſeveral times in Sicily, and was once defeated himſelf. He firſt made himſelf tyrant of Syracuſe, and then of all Sicily; after which, he vanquiſhed the Carthaginians again both in Sicily and Africa. But at length having ill ſucceſs, and being in arrears with his ſoldiers, they mutinied, forced him to fly his camp, and cut the throats of his children, whom he left behind. Recovering himſelf again, he relieved Corfou, beſieged by Caſſander; burnt the Macedonian fleet; returned to Sicily; murdered the wives and children of thoſe who had murdered his; afterwards meeting with the ſoldiers themſelves, he put them all to the ſword; and ravaging the ſea-coaſt of Italy, took the city of Hipponium. He was at length poiſoned by his grandſon Archagathus, in the 72d year of his age, 290 years before Chriſt, having reigned 28 years.

AGATHYRNA, or Agathyrnum, Agathyrsa, or Agathyrsum, (anc. geog.), a town of Sicily; now *S Marco*; as old as the war of Troy, being built by Agathyrnus, ſon of Æolus, on an eminence. The gentilitious name is *Agathyrnæus*; or, according to the Roman idiom, *Agathyrnenſis*.

AGAVE, the common American aloe: A genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method ranking under the 10th order, *Coronariæ*. The characters are: There is no *calyx*: The *corolla* is monopetalous and funnel-ſhaped; the border ſix-parted, with lanced erect diviſions; The *ſtamina* conſiſt of ſix erect filaments, longer than the corolla; the antheræ are linear, ſhorter than the filaments, and verſatile: The *piſtillum* is an oblong germen; the ſtylus is filiform, the length of the ſtamina, and triangular; the ſtigma headed and triangular: The *pericarpium* is an oblong triangular capſule, trilocular and three-valved: The *ſeeds* are numerous. Of this genus, botanical writers enumerate eight ſpecies.

Of the Americana, or great American aloe, the ſtems generally riſe upwards of 20 feet high, and branch out on every ſide towards the top, ſo as to form a kind of pyramid: the ſlender ſhoots being garniſhed with greeniſh yellow flowers, which ſtand erect, and come out in thick cluſters at every joint: theſe make a fine appearance, and continue long in beauty; a ſucceſſion of new flowers being produced for near three months in favourable ſeaſons, if the plant is protected from the autumnal colds. The ſeeds do not ripen in England. It has been generally thought, that theſe plants do not flower till they are 100 years old: but this is a miſtake; for the time of their flowering depends on their growth: ſo that in hot countries, where they grow faſt, and ex-

Adge, Age.

pand many leaves every ſeaſon, they will flower in a few years; but in colder climates, where their growth is ſlow, it will be much longer before they ſhoot up their ſtem. There is a variety of this ſpecies with ſtriped leaves, which are pretty common in the Engliſh gardens. The other ſorts are ſo tender, that they muſt conſtantly remain in the ſtove.

ADGE, a city of France, in Lower Languedoc, in the territory of Agadez, with a biſhop's ſee. The dioceſe is ſmall, but is one of the richeſt countries in the kingdom. It produces fine wool, wine, oil, corn, and ſilk. It is ſeated on the river Eraut, a mile and a quarter from its mouth, where it falls into the gulph of Lyons, and where there is a fort built to guard its entrance. It is well peopled; the houſes are built of black ſtone, and there is an entrance into the city by four gates. The greateſt part of the inhabitants are merchants or ſeamen. The public buildings are but mean: the cathedral is ſmall, and not very handſome: the biſhop's palace is an old building, but convenient. The city is extended along the river, where it forms a little port, wherein ſmall craft may enter. There is a great concourſe of pilgrims and other devout people to the chapel of Notre Dame de Grace. It is a little without the city, between which and the chapel there are about 13 or 14 oratories, which they viſit with naked feet. The convent of the Capuchins is well built, and on the outſide are lodgings and apartments for the pilgrims who come to perform their *neuvaine* or nine days devotion. The chapel, which contains the image of the Vigin Mary, is diſtinct from the convent. E. Long. 3. 20. Lat. 43. 19.

AGE, in the moſt general ſenſe of the word, ſignifies the duration of any being, from its firſt coming into exiſtence to the time of ſpeaking of it, if it ſtill continues; or to its deſtruction, if it has ceaſed to exiſt ſome time before we happen to mention it.

Among the ancient poets, this word was uſed for the ſpace of thirty years; in which ſenſe, *age* amounts to much the ſame with *generation*. Thus, Neſtor is ſaid to have lived *three ages* when he was 90 years old.—By ancient Greek hiſtorians, the time elapſed ſince the beginning of the world is divided into three periods, which they called *ages*. The firſt reaches from the creation to the deluge which happened in Greece during the reign of Ogyges; this they called the *obſcure* or *uncertain* age, becauſe the hiſtory of mankind is altogether uncertain during that period. The ſecond they call the *fabulous* or *heroic* age, becauſe it is the period in which the fabulous exploits of their gods and heroes are ſaid to have been performed. It began with the Ogygian deluge, and continued to the firſt Olympiad; where the third or *hiſtorical* age commenced.—This diviſion, however, it muſt be obſerved, holds good only with regard to the Greeks and Romans, who had no hiſtories earlier than the firſt Olympiad; the Jews, Egyptians, Phenicians, and Chaldees, not to mention the Indians and Chineſe, who pretend to much higher antiquity, are not included in it.

The interval ſince the firſt formation of man has been divided by the poets into four *ages*, diſtinguiſhed by the epithets of *golden*, *ſilver*, *brazen*, and *iron*. During the *golden* age, Saturn reigned in heaven, and juſtice and innocence in this lower world. The earth then yielded her productions without culture; men held all things in common, and lived in perfect friendſhip. This period is ſuppoſed to have laſted till the expulſion of Saturn from his kingdom. The *ſilver* age commenced when men began to deviate from the paths of virtue; and in conſequence of this deviation, their lives became leſs happy. The *brazen* age commenced on a farther deviation, and the *iron* age took place in conſequence of one ſtill greater.—A late author, however, reflecting on the barbariſm of the firſt ages, will have the order which the poets aſſign to the four ages inverted; the firſt being a time of rudeneſs and ignorance, more properly denominated an *iron* than a *golden* age. When cities and ſtates were founded, the *ſilver* age commenced; and ſince arts and ſciences, navigation and commerce, have been cultivated, the *golden* age has taken place.

In ſome ancient northern monuments, the *rocky* or *ſtony* age correſponds to the *brazen* age of the Greeks. It is called *rocky*, on account of Noah's ark, which reſted on mount Ararat; whence men were ſaid to be deſcended or ſprung from mountains: or from Deucalion and Pyrrha reſtoring the race of mankind, by throwing ſtones over their heads. The northern poets alſo ſtyle the fourth age of the world the *aſhen* age, from a Gothic king Madenis, or Mannus, who on account of his great ſtrength was ſaid to be made of aſh, or becauſe in his time people began to make uſe of weapons made of that wood.

Among the Jews, the duration of the world is alſo divided into three ages. 1. The *ſeculum inane*, or *void age*, was the ſpace of time from the creation to Moſes. 2. The *preſent* age, denotes all the ſpace of time from Moſes to the coming of the Meſſiah; and, 3. The *age to come*, denotes the time from the coming of the Meſſiah to the end of the world.

Various other diviſions of the duration of the world into *ages* have been made by hiſtorians.—The Sibylline oracles, wrote, according to ſome, by Jews acquainted with the prophecies of the Old Teſtament, divide the duration of the world into ten *ages*; and according to Joſephus, each age contained ſix hundred years. It appears, by Virgil's fourth eclogue, and other teſtimonies, that the age of Auguſtus was reputed the end of thoſe ten *ages*, conſequently as the period of the world's duration.

By ſome, the ſpace of time commencing from Conſtantine, and ending with the taking of Conſtantinople by the Turks in the 15th century, is called the *middle age*: but others chooſe rather to date the middle age from the diviſion of the empire made by Theodoſius at the cloſe of the 4th century, and extend it to the time of the emperor Maximilian I. in the beginning of the 16th century, when the empire was firſt divided into circles.—The *middle* is by ſome denoted the *barbarous* age, and the latter part of it the *loweſt* age. Some divide it into the *non-academical* and *academical* ages. The firſt includes the ſpace of time from the 6th to the 9th centuries, during which ſchools or academies were loſt in Europe. The ſecond from the 9th century, when ſchools were reſtored, and univerſities eſtabliſhed, chiefly by the care of Charlemagne.

The ſeveral *ages* of the world may be reduced to three grand epochas, *viz.* the *age* of the law of nature, called by

by the Jews the *void age*, from Adam to Moses; the *age* of the Jewish law, from Moses to Christ; and the *age* of grace, from Christ to the present year.

Age is also frequently used in the same sense with *century*, to denominate a duration of 100 years.

Age likewise signifies a certain period of the duration of human life: by some divided into four stages, namely, infancy, youth, manhood, and old age; the first extending to the 14th year, the second to the 25th, the third to the 50th, and the fourth to the end of life: by others divided into infancy, childhood, youth, manhood, and old age.

Age, in law, signifies a certain period of life, when persons of both sexes are enabled to do certain acts. Thus, one at twelve years of age ought to take the oath of allegiance to the king in a leet; at fourteen he may marry, chuse his guardian, and claim his lands held in soccage. Twenty-one is called *full age*, a man or woman being then capable of acting for themselves, of managing their affairs, making contracts, disposing of their estates, and the like.

Age of a Horse. See Horse.

Age of Trees. These after a certain age waste. An oak at an hundred years old ceases to grow. The usual rule for judging of the *age* of wood, is by the number of circles which appear in the substance of a trunk or stock cut perpendicularly, each circle being supposed the growth of a year: though some reject this method as precarious, alleging, that a simple circle is sometimes the produce of several years; besides that, after a certain age, no new circles are formed.

Age-prier, in law, is when an action being brought against a person under age, for lands descended to him, he, by motion or petition, shews the matter to the court, praying the action may be staid till his full age, which the court generally agrees to.

AGELNOTH, Egelnoth, or Æthelnoth, in Latin *Achelnotus*, archbishop of Canterbury, in the reign of Canute the Great, succeeded Livingus in that see in the year 1020. This prelate, sirnamed the *Good*, was son of earl Agilmer, and, at the time of his election, dean of Canterbury. After his promotion he went to Rome, and received his pall from Pope Benedict VIII. In his way thither, as he passed through Pavia, he purchased, for an hundred talents of silver and one of gold, St Augustin's arm, which was kept there as a relic; and sent it over to England as a present to Leofric earl of Coventry. Upon his return, he is said to have raised the see of Canterbury to its former lustre. He was much in favour with king Canute, and employed his interest with that monarch to good purposes. It was by his advice the king sent over large sums of money for the support of the foreign churches; and Malmsbury observes, that this prince was prompted to acts of piety, and restrained from excesses, by the regard he had for the archbishop. Agelnoth, after he had sat 17 years in the see of Canterbury, departed this life the 29th of October 1038, and was succeeded by Eadsius, king Harold's chaplain.—This archbishop was an author, having written, 1. A Panegyric on the blessed Virgin Mary. 2. A Letter to Earl Leofric concerning St Augustin. 3. Letters to several persons.

AGEMA, in Macedonian antiquity, was a body of soldiery, not unlike the Roman legion.

AGEMOGLANS, Agiamoglans, or Azamoglans, in the Turkish polity, are children purchased from the Tartars, or raised every third year, by way of tribute, from the Christians tolerated in the Turkish empire. These, after being circumcised and instructed in the religion and language of their tyrannical masters, are learnt the exercises of war, till they are of a proper age for carrying arms; and from this corps the Janissaries are recruited. With regard to those who are thought unfit for the army, they are employed in the lowest offices of the seraglio. Their appointments also are very small, not exceeding seven aspers and a half per day, which amount to about threepence-halfpenny of our money.

AGEN, a city of France, on the river Garonne, the capital of Agenois in Guienne, and the see of a bishop. The gates and old walls, which are yet remaining, show that this city is very ancient, and that its former circuit was not so great as the present. The palace, wherein the presidial holds his sessions at this day, was heretofore called the castle of Montravel, and is seated without the walls of the old city, and on the side of the fosse. There are likewise the ruins of another castle called *La Sagne*, which was without the walls close by a brook. Though the situation of Agen is very convenient for trade and commerce, the inhabitants are so very indolent that there is very little; of which the neighbouring cities take the advantage. It is seated on the bank of the river Garonne, in a pleasant country; but is itself a very mean and disagreeable place, the houses being ill built, and the streets narrow, crooked, and dirty. E. Long. 0.30. N. Lat. 44. 12.

AGENDA, among philosophers and divines, signifies the duties which a man lies under an obligation to perform: thus, we meet with the *agenda* of a Christian, or the duties he ought to perform; in opposition to the *credenda*, or things he is to believe.

Agenda, among merchants, a term sometimes used for a memorandum-book, in which is set down all the business to be transacted during the day, either at home or abroad.

Agenda, among ecclesiastical writers, denotes the service or office of the church. We meet with *agenda matutina & vespertina*, "morning and evening prayers;" *agenda diei*, "the office of the day," whether feast or fast day; *agenda mortuorum*, called also simply *agenda*, "the service of the dead."

Agenda is also applied to certain church-books, compiled by public authority, prescribing the order and manner to be observed by the ministers and people in the principal ceremonies and devotions of the church. In which sense, *agenda* amounts to the same with what is otherwise called *ritual*, *liturgy*, *acalouthia*, *missal*, *formulary*, *directory*, &c.

AGENHINE, in our old writers, signifies a guest that has lodged at an inn for three nights, after which time he was accounted one of the family; and if he offended the king's peace, his host was answerable for him. It is also written hogenhine and hogenhyne.

AGENORIA, in mythology, the goddess of courage and industry, as *Vacuna* was of indolence.

AGENT, in a general sense, denotes any active power or cause. Agents are either natural or moral. Natural agents are such inanimate bodies as have a

power to act upon other bodies in a certain and determinate manner; as, gravity, fire, &c. Moral agents, on the contrary, are rational creatures, capable of regulating their actions by a certain rule.

Agent, is also used to denote a person intrusted with the management of an affair, whether belonging to a society, company, or private person.

Agentes in rebus, one of the ranks of officers in the court of the Constantinopolitan emperors, whose business was to collect and convey the corn both for the army and household; to carry letters and messages from court to all parts of the empire; to regulate couriers, and their vehicles; to make frequent journeys and expeditions through the provinces, in order to inspect any motions, disturbances, or machinations tending that way, and to give early notice thereof to the emperor.

The *agentes in rebus*, are by some made synonymous with our post-masters, but their functions were of great extent. They correspond to what the Greeks call πυροφοροι, and the Latins *veredarii*.

There were various orders or degrees of *agentes in rebus*; as, *tribuni*, *primicerii*, *senatores*, *ducenarii*, *biarchi*, *circitores*, *equites*, *tyrones*, &c. through all which they rose *gradatim*. Their chief, who resided at Constantinople, was denominated *princeps*; which was a post of great dignity, being reckoned on a level with that of proconsul. They were settled in every part of the empire; and are also said to have served as interpreters.

AGER, in Roman antiquity, a certain portion of land allowed to each citizen. See Agrarian Law.

AGER picenus, or *Picenum*, (anc. geog.) a territory of Italy to the south-east of Umbria, reaching from the Apennine to the Adriatic. The people are called *Picentes* (Cicero, Livy), distinct from the Picentini on the Tuscan sea, though called by Greek writers Πικεντινοι. This name is said to be from the bird *Picus*, under whose conduct they removed from the Sabines, of whom they were a colony.

AGERATUM, bastard hemp-agrimony: A genus of the polygamia æqualis order, belonging to the syngenesia class of plants; and in the natural method ranking under the 49th order, *Compositæ discoides*. The characters are: The common *calyx* is oblong, with many scales. The compound *corolla* is uniform; the corollets hermaphrodite, tubular, and numerous: the proper corolla is funnel-shaped; the border 4-cleft, and expanded. The *stamina* consist of 5 capillary very short filaments; the anthera is cylindric and tubular. The *pistillum* is an oblong germen; with a filiform stylus, and two slender erect stigmata. There is no *pericarpium*; the *calyx* unchanged. The *seeds* are solitary, oblong, and angular. The *receptaculum* is naked, convex, and very small. Of this genus there are three

Species; the conyzoides, the houstonianum, and the altissimum. All these are natives of warm climates. The two first are annual plants, and consequently can be propagated only by seeds; which, however, come to perfection in this country. The third species will bear the severest cold of this country, but its seeds do not ripen in it.

Ageratum, or Maudlin. See Achillæa.

AGESILAUS, king of the Lacedæmonians, the son of Archidamus, was raised to the throne notwithstanding the superior claim of Leotychides. As soon as he came to the throne, he advised the Lacedæmonians to be beforehand with the king of Persia, who was making great preparations for war, and to attack him in his own dominions. He was himself chosen for this expedition; and gained so many advantages over the enemy, that if the league which the Athenians and the Thebans formed against the Lacedæmonians had not obliged him to return home, he would have carried his victorious arms into the very heart of the Persian empire. He gave up, however, all these triumphs readily, to come to the succour of his country, which he happily relieved by his victory over the allies in Bœotia. He obtained another near Corinth; but to his great mortification, the Thebans afterward gained several over the Lacedæmonians. These misfortunes at first raised somewhat of a clamour against him. He had been sick during the first advantages which the enemy gained; but as soon as he was able to act in person, by his valour and prudence he prevented the Thebans from reaping the advantages of their victories; insomuch that it was generally believed, had he been in health at the beginning, the Lacedæmonians would have sustained no losses, and that all would have been lost had it not been for his assistance. It cannot be denied but he loved war more than the interest of his country required; for if he could have lived in peace, he had saved the Lacedæmonians several losses, and they would not have been engaged in many enterprises which in the end contributed much to weaken their power. He died in the third year of the 104th Olympiad, being the 84th year of his age, and 41st year of his reign. Agesilaus would never suffer any picture or sculpture to be made of him, and prohibited it also by his will: this he is supposed to have done from a consciousness of his own deformity; for he was of a short stature, and lame of one foot, so that strangers used to despise him at the first sight. His fame went before him into Egypt, and there they had formed the highest idea of Agesilaus. When he landed in that country, the people ran in crowds to see him: but great was their surprise when they saw an ill-dressed, slovenly, mean-looking little fellow lying upon the grass; they could not forbear laughing, and applied to him the fable of the mountain in labour. He was, however, the first to jest upon his own person; and such was the gaiety of his temper, and the strength with which he bore the roughest exercises, that these qualities made amends for his corporal defects. He was extremely remarkable for plainness and frugality in his dress and way of living. "This (says Cornelius Nepos) is especially to be admired in Agesilaus: when very great presents were sent him by kings, governors, and states, he never brought any of them to his own house; he changed nothing of the diet, nothing of the apparel of the Lacedæmonians. He was contented with the same house in which Euristhenes, the founder of his family, had lived: and whoever entered there, could see no sign of debauchery, none of luxury; but on the contrary, many of moderation and abstinence; for it was furnished in such a manner, that it differed in nothing from that of any poor or private person." Upon his arrival into Egypt, all kind of provisions were sent to him; but he chose only the most common, leaving the perfumes, the confections, and all that was esteemed most delicious, to his servants. Agesilaus was extremely fond of his children, and would often amuse himself by

joining in their diverfions: one day when he was furprifed riding upon a ftick with them, he faid to the perfon who had feen him in this pofture, "Forbear talking of it till you are a father."

AGGA, or AGGONNA, a Britifh fettlement on the gold-coaft of Guinea. It is fituated under the meridian of London, in 6 degrees of N. lat.

AGGER, in the ancient military art, a work of fortification, ufed both for the defence and the attack of towns, camps, &c. In which fenfe it is the fame with what was otherwife called *vallum*, and in later times *aggeftum;* and among the moderns *lines*, fometimes *cavaliers*, *terraffes*, &c. The agger was ufually a bank, or elevation of earth or other matter, bound and fupported with timber; having fometimes turrets on the top, wherein the workmen, engineers, and foldiery, were placed. It was alfo accompanied with a ditch, which ferved as its chief defence. The ufual materials of which it was made were earth, boughs, fafcines, ftakes, and even trunks of trees, ropes, &c. varioufly croffed, and interwoven fomewhat in the figure of ftars; whence they were called *ftellati axes.* Where thefe were wanting, ftones, bricks, tiles, fupplied the office: on fome occafions, arms, utenfils, pack-faddles, were thrown in to fill it up. We even read of aggers formed of the carcafes of the flain; fometimes of dead bones mixed with lime; and even with the heads of flaughtered citizens. For want of due binding, or folid materials, aggers have fometimes tumbled down, with infinite mifchief to the men. The befiegers ufed to carry on a work of this kind nearer and nearer towards the place, till at length they reached the very wall. The methods taken, on the other fide, to defeat them, were by fire, efpecially if the agger were of wood; by fapping and undermining, if of earth; and, in fome cafes, by erecting a counter agger.

The height of the agger was frequently equal to that of the wall of the place. Cæfar tells us of one he made, which was 30 feet high and 330 feet broad. Befides the ufe of aggers before towns, the generals ufed to fortify their camps with fuch works; for want of this precaution, armies have often been furprifed and ruined.

There were vaft aggers made in towns and places on the fea-fide, fortified with towers, caftles, &c. Thofe made by Cæfar and Pompey at Brundufium, are famous. Sometimes aggers were even built acrofs arms of the fea, lakes, and moraffes; as was done by Alexder before Tyre, and by M. Antony and Caffius.—The wall of Severus, in the north of England, may be confidered as a grand agger, to which belong feveral leffer ones. See *SEVERUS's Wall.*

AGGER, in ancient writers, likewife denotes the middle part of a military road, raifed into a ridge, with a gentle flope on either fide, to make a drain for the water, and keep the way dry.

The term is alfo ufed for the whole road, or military way. Where highways were to be made in low grounds, as between two hills, the Romans ufed to raife them above the adjacent land, fo as to make them of a level with the hills. Thefe banks they called *aggeres.* Bergier mentions feveral in Gallia Belgica, which were thus raifed ten, fifteen, or twenty feet above ground. —They are fometimes alfo called *aggeres calceati;* and now generally known by the name *chauffees*, or *caufeways.*

AGGERHUYS, a city of Norway, capital of the province of the fame name. It is fubject to Denmark, and fituated in E. Long. 28. 35. and N. Lat. 59. 30.

AGGERS-HERRED, a diftrict of Chriftianfand and a diocefe of Norway. It confifts of three juridical places; namely, Afcher, Weft Barum, and Ager.

AGGLUTINANTS, in pharmacy, a general name for all medicines of a glutinous or vifcid nature; which, by adhering to the folids, contribute greatly to repair their lofs.

AGGLUTINATION, in a general fenfe, denotes the joining two or more things together, by means of a proper glue or cement.

AGGLUTINATION, among phyficians, implies the action of reuniting the parts of a body, feparated by a wound, cut, &c. It is alfo applied to the action of fuch internal medicines as are of an agglutinating quality, and which, by giving a glutinous confiftence to the animal-fluids, render them more proper for nourifhing the body.

AGGREGATE, in a general fenfe, denotes the fum of feveral things added together, or the collection of them into one whole. Thus, a houfe is an aggregate of ftones, wood, mortar, &c. It differs from a mixed or compound, inafmuch as the union of thefe laft is more intimate than between the parts of an aggregate.

AGGREGATE, in botany, is a term ufed to exprefs thofe flowers, which are compofed of parts or florets; fo united by means either of the receptacle or calyx, that no one of them can be taken away without deftroying the form of the whole. They are oppofed to fimple flowers, which have no fuch common part, and are ufually divided into feven kinds, viz. the *aggregate*, properly fo called, whofe receptacle is dilated, and whofe florets are fupported by foot-ftalks; fuch are the blue daify, thrift, or fea-pink, &c.; the *compound;* the *umbellati;* the *cymofe;* the *amentaceous;* the *glumofe;* and the *fpadiceous.*

AGGREGATION, in phyfics, a fpecies of union whereby feveral things which have no natural dependence or connection with one another are collected together, fo as in fome fenfe to conftitute one. Thus, a heap of fand, or a mafs of ruins, are bodies by aggregation.

AGHER, a town of Ireland, which fends two members to parliament. It is fituated in the fouthern part of Ulfter, not far from Clogher.

AGHRIM, a town of Ireland, in the county of Wicklow, and province of Leinfter, fituated about 13 miles fouth-weft of Wicklow.

AGHRIM, in Galway; a fmall village, diftant about 32 miles from Dublin, and rendered memorable by a decifive battle fought there, and at Kilcommodon-hill, the 12th of July 1691, between general Ginckle and Monfieur St Ruth, the commanders under king William III. and James II. when St Ruth, the general of the Irifh army, with 7000 of his men, were flain; but of the Englifh only 600. The victory was the more confiderable, as the Englifh army confifted of no more than 18,000 men; whereas the Irifh were computed at 20,000 foot and 5000 horfe and dragoons. They loft likewife nine pieces of brafs cannon; all their ammunition,

tion, tents, and baggage; moſt of their ſmall arms, which they threw away to expedite their flight; with 11 ſtandards, and 32 pair of colours.

AGIADES, in the Turkiſh armies, a kind of pioneers employed in fortifying camps, ſmoothing of roads, and the like offices.

AGILITY, an aptitude of the ſeveral parts of the body to motion.—The improving of agility was one of the chief objects of the inſtitution of games and exercifes. The athletæ made particular profeſſion of the ſcience of cultivating and improving agility. Agility of body is often ſuppoſed peculiar to ſome people; yet it ſeems leſs owing to any thing peculiar, in their frame and ſtructure, than to practice.

AGINCOURT, a village of the French Netherlands, ſituated in E. Long. 2. 10. N. Lat. 50. 35.; famous on account of the victory obtained by Henry V. of England over the French, in 1415.

The army of Henry, after landing in France, was by various accidents reduced to 10,000 men, of whom not a few were ſick, or ſlowly recovering from ſickneſs;—they had to traverſe a long tract of country, inhabited by exaſperated enemies, from whom they were to procure proviſions, lodgings, guides, intelligence, and every thing they wanted;—that country was defended by many ſtrong towns, interſected by deep rivers, and guarded by an army of 100,000, or (according to ſome contemporary writers) 140,000 men.

Henry, undaunted by all theſe dangers and difficulties, departed from Harfleur, marching his army in three lines, with bodies of cavalry on the wings. He proceeded by very eaſy journeys, that he might not fatigue his troops, or diſcourage them by the appearance of a flight; obſerving the ſtricteſt diſcipline, and paying generouſly for every thing he received; which induced the country people to bring proviſions to his camp, in ſpite of all the commands they had received to the contrary. To keep his men in ſpirits, and from repining, the king fared as ill as the meaneſt ſoldier, always appearing with a cheerful countenance, and addreſſing them in the moſt friendly and encouraging language. They arrived at the village of Agincourt, in the county of St Pol, on the evening of October 24th; and there beheld the whole French army, at a ſmall diſtance, directly in their route. The king took an attentive view of it from an eminence; and being fully convinced that it was impoſſible to proceed any further on his way to Calais without a battle, and equally impoſſible to return to Harfleur with ſo great an army in his rear, he reſolved to hazard an action next morning, as the only means of preſerving himſelf and his little army from deſtruction.

The Engliſh army lodged that night in the villages of Agincourt, Maiſoncelle, and ſome others; where they met with better accommodation than they had been accuſtomed to for ſome time paſt, and ſpent part of their time in mutual exhortations to fight bravely in the approaching battle. The king, overhearing ſome of his nobles expreſſing a wiſh that the many brave men who were idle in England were preſent to aſſiſt them, is ſaid to have cried out—"No! I would not have one man more:—if we are defeated, we are too many—if it ſhall pleaſe God to give us the victory, as I truſt he will, the ſmaller our number the greater our glory." The moon happening to ſhine very bright, Henry, with ſome of his beſt officers, carefully examined the ground, and pitched upon a field of battle, admirably calculated to preſerve a ſmall army from being ſurrounded by a great one. It was a gentle declivity from the village of Agincourt, of ſufficient extent for his ſmall army, defended on each ſide by hedges, trees, and bruſh-wood. Having placed guards and kindled fires on all ſides, the king and his army betook themſelves to reſt; except ſuch as were of a more ſerious turn of mind, and, conſidering that as the laſt night of their lives, ſpent it in devotion.

The French, exulting in their numbers, confident of victory, and abounding in proviſions, ſpent the night in noiſy feſtivity, and in forming fanciful ſchemes about the diſpoſal of their priſoners and their booty. It was in general reſolved to put all the Engliſh to the ſword, except the king and the chief nobility, who were to be taken priſoners for the ſake of their ranſoms.

On the morning of Friday, the memorable 25th of October, A. D. 1415, the day of Criſpin and Criſpianus, the Engliſh and French armies were ranged in order of battle, each in three lines, with bodies of cavalry on each wing. The Conſtable D'Albert, who commanded the French army, fell into the ſnare that was laid for him, by drawing up his army in the narrow plain between the two woods. This deprived him, in a great meaſure, of the advantage he ſhould have derived from the prodigious ſuperiority of his numbers; obliged him to make his lines unneceſſarily deep, about 30 men in file; to crowd his troops, particularly his cavalry, ſo cloſe together, that they could hardly move or uſe their arms; and, in a word, was the chief cauſe of all the diſaſters that followed. The French, it is ſaid, had a conſiderable number of cannon of different ſizes in the field; but we do not hear that they did any execution, probably for want of room. The firſt line of the French army, which conſiſted of 8000 men-at-arms on foot mixed with 4000 archers, with 500 men-at-arms mounted on each wing, was commanded by the Conſtable D'Albert, the dukes of Orleans and Bourbon, and many other nobles; the dukes of Alençon, Brabant, and Bar, &c. conducted the ſecond line; and the earls of Marle, Damartine, Fauconberg, &c. were at the head of the third line. The king of England employed various arts to ſupply his defect of numbers. He placed 200 of his beſt archers in ambuſh, in a low meadow, on the flank of the firſt line of the French. His own firſt line conſiſted wholly of archers, four in file; each of whom, beſides his bow and arrows, had a battle-axe, a ſword, and a ſtake pointed with iron at both ends, which he fixed before him in the ground, the point inclining outwards, to protect him from cavalry; which was a new invention, and had a happy effect. That he might not be encumbered, he diſmiſſed all his priſoners, on their word of honour to ſurrender themſelves at Calais, if he obtained the victory; and lodged all his baggage in the village of Agincourt, in his rear, under a ſlender guard. The command of the firſt line was, at his earneſt requeſt, committed to Edward duke of York, aſſiſted by the lords Beaumont, Willoughby, and Fanhope; the ſecond was conducted by the king, with his youngeſt brother Humphry duke of Glouceſter, the earls of Oxford, Marſhal, and Suffolk; and the third was led by the duke

Agincourt. duke of Exeter, the king's uncle. The lines being formed, the king, in ſhining armour, with a crown of gold adorned with precious ſtones on his helmet, mounted on a fine white horſe, rode along them, and addreſſed each corps with a cheerful countenance and animating ſpeeches. To inflame their reſentment againſt their enemies, he told them, that the French had determined to cut off three fingers of the right hand of every priſoner; and to rouſe their love of honour, he declared, that every ſoldier in that army who behaved well, ſhould from henceforth be deemed a gentleman, and intitled to bear coat-armour.

When the two armies were drawn up in this manner, they ſtood a conſiderable time gazing at one another in ſolemn ſilence. But the king, dreading that the French would diſcover the danger of their ſituation and decline a battle, commanded the charge to be ſounded, about ten o'clock in the forenoon. At that inſtant, the firſt line of the Engliſh kneeled down, and kiſſed the ground; and then ſtarting up, diſcharged a flight of arrows, which did great execution among the crowded ranks of the French. Immediately after, upon a ſignal being given, the archers in ambuſh aroſe, and diſcharged their arrows on the flank of the French line, and threw it into ſome diſorder. The battle now became general, and raged with uncommon fury. The Engliſh archers, having expended all their arrows, threw away their bows, and, ruſhing forward, made dreadful havoc with their ſwords and battle-axes. The firſt line of the enemy was, by theſe means, defeated; its leaders being either killed or taken priſoners. The ſecond line, commanded by the duke D'Alençon, (who had made a vow either to kill or take the king of England, or to periſh in the attempt), now advanced to the charge, and was encountered by the ſecond line of the Engliſh, conducted by the king. This conflict was more cloſe and furious than the former. The duke of Glouceſter, wounded and unhorſed, was protected by his royal brother till he was carried off the field. The duke D'Alençon forced his way to the king, and aſſaulted him with great fury; but that prince brought him to the ground, where he was inſtantly diſpatched. Diſcouraged by this diſaſter, the ſecond line made no more reſiſtance; and the third fled without ſtriking a blow; yielding a complete and glorious victory to the Engliſh, after a violent ſtruggle of three hours duration.

The king did not permit his men to purſue the fugitives to a great diſtance, but encouraged them to take as many priſoners as they could on or near the field; in which they were ſo ſucceſsful, that, in a little time, his captives were more numerous than his ſoldiers. A great proportion of theſe priſoners were men of rank and fortune; for many of the French nobleſſe being on foot, and loaded with their heavy armour, could not make their eſcape. Among theſe were the dukes of Orleans and Bourbon, the marſhal Boucicaut, the counts D'Eu, Vendome, Richemont, and Harcourt, and 7000 barons, knights, and gentlemen. The French left dead on the field of battle, the conſtable D'Albert, the three dukes of Alençon, Brabant, and Bar, the archbiſhop of Sens, one marſhal, 13 earls, 92 barons, 1500 knights, and a far greater number of gentlemen, beſides ſeveral thouſands of common ſoldiers. Even the French hiſtorians acknowledge, that the loſs of the Engliſh was inconſiderable: thoſe of our own contemporary writers who make it the greateſt, affirm, that it did not exceed 100, and that the duke of York and the earl of Suffolk were the only great men who fell on that ſide in this memorable action.

Agio ‖ Agis.

AGIO, in commerce, is a term chiefly uſed in Holland, and at Venice, to ſignify the difference between the value of bank-ſtock and the current coin. The agio in Holland is generally three or four *per cent.* and at Rome it is from 15 to 25 *per cent.* but at Venice the agio is fixed at 20 *per cent.*

AGIOSYMANDRUM, a wooden inſtrument uſed by the Greek and other churches under the dominion of the Turks, to call together aſſemblies of the people. The *agioſymandrum* was introduced in the place of bells, which the Turks prohibited their Chriſtian ſubjects the uſe of, leſt they ſhould make them ſubſervient to ſedition.

AGIS, king of Lacedæmon, was deſcended from Ageſilaus II. in a right line. He projected the reformation of his kingdom, by the reſtoring of the laws of Lycurgus; but he fell under the weight of an enterpriſe that could not but be diſagreeable to all thoſe who had great poſſeſſions, and had been long accuſtomed to the ſweets of a voluptuous life. Agis being in the flower of his age, and having a very refined deſire of glory, practiſed the ancient diſcipline firſt in his own perſon: his clothes and his table were according to the manners of former times; which is ſo much the more to be admired, becauſe Ageſiſtrata his mother and Archidamia his grandmother had brought him up voluptuouſly. When he ſounded his peoples minds, he found the younger ſort oppoſed his project leſs than thoſe who had enjoyed a relaxation of diſcipline ſeveral years. The greateſt difficulty was expected to ariſe from the women. They had at that time more credit than ever; for their power is never greater than when luxury is in faſhion. Ageſilaus's mother did not at all reliſh the propoſed reformation. She muſt have loſt her riches, which gave her a ſhare in a thouſand ſorts of intrigues; ſo ſhe oppoſed the deſign at once, and treated it as a chimera. But her brother Ageſilaus, whom Agis had engaged in his intereſts, knew how to manage her in ſuch a manner that ſhe promiſed to ſecond the enterpriſe. She endeavoured to gain the women: but inſtead of ſuffering themſelves to be perſuaded, they applied to Leonidas the other king of Lacedæmon, and humbly beſought him to fruſtrate the deſigns of his colleague. Leonidas durſt not oppoſe it openly, for fear of irritating the people; to whom the reformation was agreeable, becauſe they found their account in it. He contented himſelf with countermining it by intrigues, and ſowing ſuſpicions as if Agis had aſpired to tyranny, by pulling down the rich and raiſing the poor. Agis did not fail to propoſe his new laws to the ſenate, relating to the diſcharge of debts, and a new diviſion of the lands. Leonidas, being ſupported by the rich, oppoſed this project ſo ſtrongly, that there was one voice more againſt it than for it. He paid dear for the ſucceſs in this affair. Lyſander, one of the Ephori, who had been the grand promoter of the reformation, called him to account; alleged the celeſtial ſigns; and put to death Cleombrotus, a prince of the royal blood and ſon-in-law to Leonidas, to make ſure of the

4 kingdom.

Agiftment, Agiftor.

kingdom. Leonidas being frightened at this, took refuge in a temple; whither his daughter, the wife of Cleombrotus, followed him. He was fummoned; and becaufe he did not appear, he was degraded of his dignity, which was conferred on Cleombrotus. He obtained leave to retire to Tegæa. The new Ephori had Lyfander and Mandroclidas tried for innovation: thefe perfuaded the two kings to unite and turn out thefe Ephori. The thing was brought about; but not without a great uproar in the city. Agefilaus, one of the Ephori that fucceeded thofe who were juft turned out, would have caufed Leonidas to be killed on the way to Tegæa, if Agis had not fent him a ftrong guard. The reformation might then have been eftablifhed, if Agefilaus had not found means to elude the good intentions of the two kings. Whilft this was tranfacting, the Achaians afked affiftance; which was given them, and Agis had the command of the troops. He acquired a good deal of reputation in this campaign. At his return, he found his affairs fo embroiled by the ill conduct of Agefilaus, that it was impoffible for him to maintain himfelf. Leonidas was recalled to Lacedæmon: Agis retired into one temple and Cleomenes into another. The wife of the latter behaved herfelf in fuch a manner that fhe became the admiration of every body. Leonidas was contented with banifhing his fon-in-law; after which he applied himfelf entirely to the ruin of Agis. One of the Ephori, who had no mind to return what Agefiftrata had lent him, was the principal inftrument of the misfortune of this family. Agis never went out of his fanctuary but to bathe. One day, as he was returning from thence to the temple, he was feized by that Ephorus and carried to prifon. Then he was brought to his trial and condemned to death, and delivered to the executioner. His mother and grandmother ufed all the intreaty and importunity imaginable, that, as he was king of Lacedæmon, he might at leaft be permitted to plead his caufe before the people. But they were apprehenfive left his words would make too great an impreffion, and therefore they ordered him to be ftrangled that very hour. The Ephorus who was in debt to Agefiftrata permitted that princefs to go into the prifon; which he granted likewife to Agis's grandmother; but he gave orders to ftrangle them one after another. Agefiftrata died in a manner that was extremely to her honour. The wife of Agis, who was a princefs of great fortune and prudence, and one of the fineft ladies in Greece, was forced away from her apartment by king Leonidas, and obliged to marry his fon, who was then very young, and hardly fit for marriage.

AGISTMENT, Agistage, or Agistation, in law, the taking in other people's cattle to graze at fo much *per* week. The term is peculiarly ufed for the taking cattle to feed in the king's forefts, as well as for the profits arifing from that practice.—It is alfo ufed, in a metaphorical fenfe, for any tax, burden, or change; thus, the tax levied for repairing the banks of Romney-marfh was called *agiftamentum*.

AGISTOR, or Agistator, an officer belonging to forefts, who has the care of cattle taken in to be grazed, and levies the moneys due on that account. They are generally called *queft-takers* or *gift-takers*, and are created by letters-patent. Each royal foreft has four agiftors.

Agifymba ‖ Agmen.

AGISYMBA (anc. geog.), a diftrict of Libya Interior, according to Agathemerus, fituated to the fouth-eaft of the Æthiopes Anthropophagi; the parallel paffing through which, at 16° to the fouth of the equator, was the utmoft extent of the knowledge of the ancients to the fouth (Ptolemy).

AGITATION, the act of fhaking a body, or toffing it backwards and forwards.

Agitation, in phyfics, is often ufed for an inteftine commotion of the parts of a natural body. Fermentation and effervefcence are attended with a brifk agitation of the particles.

Agitation is one of the chief caufes or inftruments of mixtion: by the agitation of the parts of the blood and chyle, in their continual circulation, fanguification is in a good meafure effected. Butter is made out of milk by the fame means: in which operation, a feparation is made of the oleous parts from the ferous, and a conjunction of the oleous together. Digeftion itfelf is only fuppofed to be an infenfible kind of agitation.

Agitation is reputed one of the fymptons of infpiration. Petit informs us*, that, in the laft century, there arofe in a church in Italy, for the fpace of a year, a vapour of an extraordinary kind, which put all the people into trembling and agitations, and unlefs they got away betimes, fet them a dancing, with ftrange contortions and gefticulations. This feems to verify what has been related of the temple of Delphi.

* Petit. de Sybilla, l. i. Nouv. Rep. Lett. tom. viii. p. 1113.

Agitation is alfo ufed in medicine for a fpecies of exercife popularly called *fwinging*. Maurice prince of Orange found this method a relief againft the fevere pains of the gout and ftone. Bartholine mentions fits of the toothach, deafnefs, &c. removed by vehement agitations of the body.

AGITATOR, in antiquity, a term fometimes ufed for a charioteer, efpecially thofe who drove in the circus at the curule games.

Agitators, in the Englifh hiftory, certain officers fet up by the army in 1647, to take care of its interefts.—Cromwell joined the agitators, only with a view to ferve his own ends; which being once accomplifhed, he found means to get them abolifhed.

AGLAIA, the name of the youngeft of the three Graces, efpoufed to Vulcan.

AGLIONBY (John), an Englifh divine, chaplain in ordinary to king James I. a man of univerfal learning, who had a very confiderable hand in the tranflation of the New Teftament appointed by king James I. in 1604.

AGMEN, in antiquity, properly denotes a Roman army in march: in which fenfe, it ftands contradiftinguifhed from *acies*, which denoted the army in battle array; though, on fome occafions, we find the two words ufed indifferently for each other. The Roman armies, in their marches, were divided into *primum agmen*, anfwering to our vanguard; *medium agmen*, our main-battle; and *poftremum agmen*, the rear-guard. The order of their march was thus: After the firft fignal with the trumpets, &c. the tents were taken down, and the baggage packed up; at the fecond fignal, the baggage was to be loaden on the horfes and carriages; and at the third fignal, they were to begin their march.

First came the *extraordinarii;* then the auxiliaries of the first wing, with their baggage; these were followed by the legions. The cavalry marched either on each side or behind.

AGNATE, in law, any male relation by the father's side.

AGNEL, an ancient French gold coin, first struck under the reign of St Louis, worth about twelve sols six deniers. The agnel is also called sometimes *mouton d'or*, and *agnel d'or*. The denomination is supposed to have arisen from the figure of a lamb, agnus, or sheep, struck on one side.

AGNO, a river of Naples, which, taking its rise in the mountainous parts of Terra di Lavoro, washes the town of Acerra; and, passing between Capua and Aversa, falls into the Mediterranean, about seven miles north of Puzzuoli.

AGNOETÆ (from αγνοεω, to be *ignorant* of), in church-history, a sect of ancient heretics, who maintained that Christ, considered as to his human nature, was ignorant of certain things, and particularly of the time of the day of judgment. Eulogius, patriarch of Alexandria, ascribes this heresy to certain solitaries in the neighbourhood of Jerusalem, who built their opinion upon the text Mark xiii. 32. "Of that day and "hour knoweth no man, no not the angels who are "in heaven, neither the Son, but the Father only."— The same passage was made use of by the Arians; and hence the orthodox divines of those days were induced to give various explications thereof. Some allege, that our Saviour here had no regard to his divine nature, but only spoke of his human. Others understand it thus, That the knowledge of the day of judgment does not concern our Saviour considered in his quality of Messiah, but God only: which is the most natural solution.

AGNOMEN, in Roman antiquity, a kind of fourth or honorary name, given to a person on account of some extraordinary action, virtue, or other accomplishment. Thus the agnomen *Africanus* was bestowed upon Publius Cornelius Scipio, on account of his great atchievements in Africa.—The agnomen was the third in order of the three Roman names: thus, in Marcus Tullius Cicero, Marcus is the prænomen, Tullius the nomen, and Cicero the *agnomen*.

AGNUS, or LAMB, in zoology, the young of the ovis or sheep. See OVIS.

AGNUS Castus, in botany, the trivial name of a species of the vitex. See VITEX. The Greeks call it αγνος, *chaste;* to which has since been added the reduplicative *castus*, *q. d.* chaste chaste. It was famous among the ancients as a specific for the preservation of chastity. The Athenian ladies, who made profession of chastity, lay upon leaves of *agnus castus* during the feasts of Ceres.—Being reputed a cooler, and particularly of the genital parts, it was anciently used in physic to allay those inordinate motions arising from seminal turgescences: but it is out of the present practice.

AGNUS Dei, in the church of Rome, a cake of wax stamped with the figure of a lamb supporting the banner of the cross. These being consecrated by the pope with great solemnity, and distributed among the people, are supposed to have great virtues; as, to preserve those who carry them worthily, and with faith, from all manner of accidents; to expel evil spirits, &c. The name literally signifies *Lamb of God;* this being supposed an image or representation of the Lamb of God who took away the sins of the world. They cover it up with a piece of stuff cut in form of a heart, and carry it very devoutly in their processions.—The Romish priests and religious derive considerable pecuniary advantage from selling these *Agnus Dei's* to some, and presenting them to others. The pope provides a regular supply, by consecrating once in seven years; they are distributed by the master of the wardrobe, and received by the cardinals and other prelates, with great reverence, in their caps and mitres.—This ceremony they pretend to derive from an ancient custom of the church, wherein part of the paschal taper consecrated on Holy Thursday was distributed among the people, to perfume their houses, fields, &c. in order to drive away devils, and to preserve them from storms and tempests. The *Agnus Dei* is forbidden to be brought into England under pain of incurring a *premunire;* 13 Eliz. cap. 2.

AGNUS Dei is also a popular name for that part of the mass wherein the priest, striking his breast three times, rehearses, with a loud voice, a prayer beginning with the words *Agnus Dei*.—The *Agnus Dei* is said to have been first brought into the missal by pope Sergius I.

AGNUS Scythicus. See *Scythian LAMB*.

AGOGE, among ancient musicians, a species of modulation, wherein the notes proceed by contiguous degrees.

AGON, among the ancients, implied any dispute or contest, whether it had regard to bodily exercises or the accomplishments of the mind; and therefore poets, musicians, painters, &c. had their agones, as well as the athletæ. Games of this kind were celebrated at most of the heathen festivals, with great solemnity, either annually, or at certain periods of years. Among the latter were celebrated at Athens, the *agon gymnicus*, the *agon nemeus* instituted by the Argives in the 53d Olympiad, and the *agon Olympius* instituted by Hercules 430 years before the first Olympiad.—The Romans also, in imitation of the Greeks, instituted contests of this kind. The emperor Aurelian established one under the name of *agon solis*, the contest of the sun; Dioclesian another, which he called *agon capitolinus*, which was celebrated every fourth year, after the manner of the Olympic games. Hence the years, instead of *lustra*, are sometimes numbered by *agones*.

AGON also signified one of the ministers employed in the Heathen sacrifices, and whose business it was to strike the victim. The name is supposed to have been derived from hence, that standing ready to give the stroke he asked, *Agon'?* or *Agone?* Shall I strike?

AGONALES, an epithet given to the SALII.

AGONALIA, in Roman antiquity, festivals celebrated in honour of Janus, or the god Agonius, whom the Romans invoked before undertaking any affair of importance.

AGONALIS CIRCUS, now *La Piazza Navona*, a long, large, beautiful street in the heart of Rome, adorned with fountains, and the obelisk of Caracalla, still retaining the form of that circus. The reason of the name *Agonalis* is either unknown or doubtful. Ovid seems to derive it from the *agones*, or solemn games, there

there celebrated; ſuppoſed to have been the *Ludi Apollinares*, or *Actiaci*, inſtituted by Auguſtus: whence the circus was called *Apollinaris;* alſo *Alexandrinus*, from the emperor Alexander Severus, who either encloſed or repaired the circus.

AGONISMA, in antiquity, denotes the prize given to the victor in any combat or diſpute.

AGONISTARCHA, from αγων "combat," and αρχος "chief," in antiquity, ſeems to have been much the ſame with *agonotheta;* though ſome ſuggeſt a difference, making it the office of the former to preſide at and direct the private exerciſes of the athletæ, which they went through by way of practice, before they made their appearance on the public theatres or amphitheatres.

AGONISTICI, in church-hiſtory, a name given by Donatus to ſuch of his diſciples as he ſent to fairs, markets, and other public places, to propagate his doctrine; for which reaſon they were alſo called *Circuitores*, *Circelliones*, *Catropitæ*, *Coropitæ*, and at Rome *Montenſes*. They were called *Agoniſtici*, from the Greek αγων, "combat," in regard they were ſent as it were to fight and ſubdue the people to their opinions.

AGONIUM, in Roman antiquity, was uſed for the day on which the *rex ſacrorum* ſacrificed a victim, as well as for the place where the games were celebrated, otherwiſe called *agon*.

AGONOTHETA, or AGONOTHETES, in Grecian antiquity, was the preſident or ſuperintendant of the ſacred games; who not only defrayed the expences attending them, but inſpected the manners and diſcipline of the athletæ, and adjudged the prizes to the victors.

AGONY, any extreme pain. It is alſo uſed for the pangs of death. Much of the terror of death conſiſts in the pangs and convulſions wherewith the agony ſeems attended; tho' we have reaſon to believe that the pain in ſuch caſes is ordinarily not extremely acute; a courſe of pain and ſickneſs having uſually ſtupified and indiſpoſed the nerves for any quick ſenſations. However, various means have been thought of for mitigating the agony of death. Lord Bacon conſiders this as part of the province of a phyſician; and that not only when ſuch a mitigation may tend to a recovery, but alſo when, there being no further hopes of a recovery, it can only tend to make the paſſage out of life more calm and eaſy. Complacency in death, which Auguſtus ſo much deſired, is certainly no ſmall part of happineſs. Accordingly the author laſt cited ranks *euthanaſia*, or the art of dying eaſily, among the deſiderata of ſcience; and does not even ſeem to diſapprove of the courſe Epicurus took for that end,

——*Hinc ſtygias ebrius hauſit aquas.*

Opium has been applied for this purpoſe, with the applauſe of ſome, but the condemnation of more.

AGONYCLITÆ, or AGONYCLITES, in church-hiſtory, a ſect of Chriſtians, in the 7th century, who prayed always ſtanding, as thinking it unlawful to kneel.

AGORÆUS, in heathen antiquity, an appellation given to ſuch dieties as had ſtatues in the market-places; particularly Mercury, whoſe ſtatue was to be ſeen in almoſt every public place.

AGORANOMUS, in Grecian antiquity, a magiſtrate of Athens, who had the regulation of weights and meaſures, the prices of proviſions, &c.—The *agoranomi*, at Athens, were ten in number, five belonging to the city, and as many to the Piræus; though others make them fifteen in all, of whom they aſſign ten to the city. To theſe a certain toll or tribute was paid, by all who brought any thing to ſell in the market.

AGOUTI, or AGUTI. See MUS.

AGRA, the capital town of a province of the ſame name, in Indoſtan, and in the dominions of the Great Mogul. It is looked upon as the largeſt city in theſe parts, and is in the form of a half-moon. A man on horſeback can hardly ride round it in a day. It is ſurrounded with a wall of red ſtone, and with a ditch 100 feet wide. The palace is prodigiouſly large, and the ſeraglio commonly contains above 1000 women. There are upwards of 800 baths in this town; but that which travellers moſt admire, is the mauſoleum of one of the Mogul's wives, which was 20 years in building. The indigo of Agra is the moſt valuable of all that comes from the Eaſt Indies. This town is ſeated on the river Jemma, about 50 miles above its confluence with the Tehemel, and is 300 miles N. E. of Surat. E. Long. 79. 12. N. Lat. 26. 29.

AGRARIAN LAWS, among the Romans, thoſe relating to the diviſion and diſtribution of lands; of which there were a great number; but that called the *Agrarian Law*, by way of eminence, was publiſhed by Spurius Caſſius, about the year of Rome 268, for dividing the conquered lands equally among all the citizens, and limiting the number of acres which each citizen might enjoy.—The Roman lands were of ſeveral kinds; ſome conquered from the enemies, and not yet brought to the public account; others brought indeed to the public, but clandeſtinely uſurped by private great men; laſtly, others purchaſed with the public money, in order to be divided. Agrarian laws, either for dividing lands taken from the enemy, or the public lands, or thoſe purchaſed with the public money, were eaſily paſſed without diſturbance; but thoſe whereby private rich men were to be deprived of their lands, and the common people put in poſſeſſion of what had been held by the nobility, were never attempted without great diſturbances.

Several have pleaded for the neceſſity of agrarian laws among us: but no author has entered ſo deeply into the ſubject as Mr Harrington in his *Oceana;* which the reader who chooſes may conſult.

AGREDA, a town of Spain, in Old Caſtile, near the frontiers of Arragon, and about three leagues ſouth-weſt of Taracon.

AGRIA, called by the Germans *Eger*, is a ſmall but ſtrong town in Upper Hungary, and is a biſhop's ſee. It is ſituated on a river of the ſame name, and has a citadel called Eriaw. It was beſieged by the Turks in 1552, with 70,000 men: but they loſt 8000 in one day; and were obliged to raiſe the ſiege, though the garriſon conſiſted only of 2000 Hungarians, aſſiſted by the women, who performed wonders on this occaſion. However, it was afterwards taken by Mahomet III. in 1596; but was retaken by the emperor in 1687; ſince which time it has continued under the dominion of the houſe of Auſtria. It is 47 miles north-eaſt of Buda, and 55 ſouth-weſt of Caſſovia. E. Long. 20. 10. N. Lat. 48. 10.

AGRICOLA (Cneus Junius), born at Frejus in

Agricola. Provence, was, in Veſpaſian's time, made lieutenant to Vettius Bolanus in Britain; and, upon his return, was ranked by that emperor among the patricians, and made governor of Aquitania. This poſt he held three years; and upon his return was choſen counſel, and afterward appointed governor of Britain, where he greatly diſtinguiſhed himſelf. He reformed many abuſes occaſioned by the avarice or negligence of former governors, put a ſtop to extortion, and cauſed juſtice to be impartially adminiſtered. Veſpaſian dying about this time, his ſon Titus, knowing the great merit of Agricola, continued him in the government. In the ſpring, he marched towards the north, where he made ſome new conqueſts, and ordered forts to be built for the Romans to winter in. He ſpent the following winter in concerting ſchemes to bring the Britons to conform to the Roman cuſtoms. He thought the beſt way of diverting them from riſing and taking arms, was to ſoften their rough manners, by propoſing to them new kinds of pleaſure, and inſpiring them with a deſire of imitating the Roman manners. Soon after this, the country was adorned with magnificent temples, porticos, baths, and many other fine buildings. The Britiſh nobles had at length their ſons educated in learning; and they who before had the utmoſt averſion to the Roman language, now began to ſtudy it with great aſſiduity: they wore likewiſe the Roman habit; and, as Tacitus obſerves, they were brought to conſider thoſe things as marks of politeneſs, which were only ſo many badges of ſlavery. Agricola, in his third campaign, advanced as far as the Tweed; and in his fourth, he ſubdued the nations betwixt the Tweed and the friths of Edinburgh and Dumbritton, into which the rivers Glotta and Bodotria diſcharge themſelves; and here he built fortreſſes to ſhut up the nations yet unconquered. In his fifth, he marched beyond the friths; where he made ſome new acquiſitions, and fixed garriſons along the weſtern coaſts, over againſt Ireland. In his ſixth campaign he paſſed the river Bodotria, ordering his fleet, the firſt which the Romans ever had in thoſe parts, to row along the coaſts, and take a view of the northern parts. In the following ſpring, the Britains raiſed an army of 30,000 men; and the command was given to Galgacus, who, according to Tacitus, made an excellent ſpeech to his countrymen on this occaſion. Agricola likewiſe addreſſed his men in very ſtrong and eloquent terms. The Romans gained the victory, and 10,000 of the Britains are ſaid to have been killed. This happened in the reign of the emperor Domitian; who, growing jealous of the glory of Agricola, recalled him, under pretence of making him governor of Syria. Agricola died ſoon after; and his death is ſuſpected to have been occaſioned by poiſon given him by that emperor. Tacitus the hiſtorian married his daughter, wrote his life, and laments his death in the moſt pathetic manner.

Agricola. Agricola (George), a German phyſician, famous for his ſkill in metals. He was born at Glaucha, in Miſnia, the 24th of March 1494. The diſcoveries which he made in the mountains of Bohemia, gave him ſo great a deſire of examining accurately into every thing relating to metals, that though he had engaged in the practice of phyſic at Joachimſtal by advice of his friends, he ſtill proſecuted his ſtudy of foſſils with great aſſiduity; and at length removed to Chemnitz, where he entirely devoted himſelf to this ſtudy. He ſpent in purſuit of it the penſion he had of Maurice duke of Saxony, and part of his own eſtate; ſo that he reaped more reputation than profit from his labours. He wrote ſeveral pieces upon this and other ſubjects; and died at Chemnitz the 21ſt of November 1555, a very firm Papiſt. In his younger years he ſeemed not averſe to the Proteſtant doctrine; and he highly diſapproved of the ſcandalous traffic of indulgences, and ſeveral other things in the church of Rome. The following lines of his were poſted up in the ſtreets of Zwickaw, in the year 1719:

Si nos injecto ſalvebit ciſtula nummo,
Heu nimium infelix tu mihi, pauper, eris!
Si nos, Chriſte, tua ſervatos morte beaſti,
Tum nihil infelix tu mihi, pauper, eris.

If wealth alone ſalvation can procure,
How ſad a ſtate for ever waits the poor!
But if thou, Chriſt, our only ſaviour be,
Thy merits ſtill may bleſs ev'n poverty!

In the latter part of his life, however, he had attacked the Proteſtant religion: which rendered him ſo odious to the Lutherans, that they ſuffered his body to remain unburied for five days together; ſo that it was obliged to be removed from Chemnitz to Zeits, where it was interred in the principal church.

Agricola (John), a Saxon divine born at Iſlebe in 1492. He went as chaplain to count Mansfield, when that nobleman attended the Elector of Saxony to the diet of Spire in 1526, and that of Auſburg in 1530. He was of a reſtleſs ambitious temper, rivalled and wrote againſt Melancthon, and gave count Mansfield occaſion to reproach him ſeverely. He obtained a profeſſorſhip at Wittemberg, where he taught particular doctrines, and became founder of the ſect of Antinomians; which occaſioned warm diſputes between him and Luther, who had before been his very good friend. But though he was never able to recover the favour either of the elector of Saxony or of Luther, he received ſome conſolation from the fame he acquired at Berlin: where he became preacher at court; and was choſen in 1548, in conjunction with Julius Phlug and Michael Heldingus, to compoſe the famous *Interim*, which made ſo much noiſe in the world. He died at Berlin in 1566.

A G R I C U L T U R E

Definition. May be defined, The art of diſpoſing the earth in ſuch a manner as to produce whatever vegetables we deſire, in large quantity, and in the greateſt perfection of which their natures are capable.—But though, by this definition, agriculture, ſtrictly ſpeaking, includes in it the cultivation of every ſpecies of vegetable whatever, and conſequently comprehends all that is underſtood of gardening and planting, we mean here to confine

fine ourſelves to the cultivation of thoſe ſpecies of grain, graſs, &c. which, in this country, are generally neceſſary as food for men and beaſts.

HISTORY. THE antiquity of this art is undoubtedly beyond that of all others; for we are informed by Scripture, that Adam was ſent from the garden of Eden *to till the ground;* and, this being the caſe, he certainly muſt have known how to do ſo.—It would be ridiculous, however, to imagine that he was acquainted with all the methods of ploughing, harrowing, fallowing, &c. which are now made uſe of; and it would be equally ſo to ſuppoſe, that he uſed ſuch clumſy and unartful inſtruments as wooden hooks, horns of oxen, &c. to dig the ground, which were afterwards employed for this purpoſe by certain ſavages: but as we know nothing of the particular circumſtances in which he was ſituated, we can know as little concerning his method of agriculture.

The prodigious length of life which the antediluvians enjoyed, muſt have been very favourable to the advancement of arts and ſciences, eſpecially agriculture, to which it behoved them to apply themſelves in a particular manner, in order to procure their ſubſiſtence. It is probable, therefore, that, even in the antediluvian world, arts and ſciences had made great progreſs, nay, might be farther advanced in ſome reſpects than they are at preſent. Of this, however, we can form no judgment, as there are no hiſtories of thoſe times, and the ſcripture gives us but very ſlight hints concerning theſe matters.

No doubt, by the terrible cataſtrophe of the flood, which overwhelmed the whole world, many ſciences would be entirely loſt, and agriculture would ſuffer; as it was impoſſible that Noah or his children could put in practice, or perhaps know, all the different methods of cultivating the ground that were formerly uſed. The common methods, however, we cannot but ſuppoſe to have been known to him and his children, and by them tranſmitted to their poſterity: ſo that as long as mankind continued in one body without being diſperſed into different nations, the arts, agriculture eſpecially, would neceſſarily advance; and that they did ſo, is evident from the undertaking of the tower of Babel. It is from the diſperſion of mankind conſequent upon the confuſion of tongues, that we muſt date the origin of ſavage nations. In all ſocieties where different arts are cultivated, there are ſome perſons who have a kind of general knowledge of moſt of thoſe practiſed through the whole ſociety, while others are in a manner ignorant of every one of them. If we ſuppoſe a few people of underſtanding to ſeparate from the reſt, and become the founders of a nation, it will probably be a civilized one, and the arts will begin to flouriſh from its very origin; but, if a nation is founded by others whoſe intellects are in a manner callous to every human ſcience (and of this kind there are many in the moſt learned countries), the little knowledge or memory of arts that were among the original founders will be loſt, and ſuch a people will continue in a ſtate of barbariſm for many ages, unleſs the arts be brought to them from other nations.

From this, or ſimilar cauſes, all nations of equal antiquity have not been equally ſavage, nor is there any ſolid reaſon for concluding that all nations were originally unſkilled in agriculture; though as we know not the original inſtruments of huſbandry uſed by mankind when living in one ſociety, we cannot fix the date of the improvements in this art. Different nations have always been in a different ſtate of civilization; and agriculture, as well as other arts, has always been in different degrees of improvement among different nations at the ſame time.

From the earlieſt accounts of the eaſtern nations, we have reaſon to think, that agriculture has at all times been underſtood by them in conſiderable perfection; ſeeing they were always ſupplied not only with the neceſſaries, but the greateſt luxuries of life.

As ſoon as the deſcendants of Abraham were ſettled in Paleſtine, they generally became huſbandmen, from the chiefs of the tribe of Judah to the loweſt branch of the family of Benjamin. High birth or rank did not at that time make any diſtinction, for agriculture was conſidered as the moſt honourable of all employments; witneſs the illuſtrious examples of Gideon, Saul, and David.

The Chaldeans, who inhabited the country where agriculture had its birth, carried that valuable art to a degree of excellence unknown in former times. They cultivated their lands with great aſſiduity, and ſeem to have found out ſome means of reſtoring fertility to an exhauſted ſoil, by having plentiful harveſts in ſucceſſion; on which account they were not obliged, as their predeceſſors had been, to change their ſituations, in order to obtain a ſufficiency for themſelves and their numerous flocks and herds.

The Egyptians, who, from the natural fertility of their country by the overflowing of the Nile, raiſed every year vaſt quantities of corn, were ſo ſenſible of the bleſſings reſulting from agriculture, that they aſcribed the invention of that art to Oſiris. They alſo regarded Iſis, their ſecond deity, as the diſcoverer of the uſe of wheat and barley, which before grew wild in the fields, and were not applied by that people to the purpoſes of food. Their ſuperſtitious gratitude was carried ſo far, as to worſhip thoſe animals which were employed in tillage; and even to the produce of their lands, as leeks, onions, &c.

The divine honours paid to Bacchus in India were derived from the ſame ſource, he being conſidered in that country as the inventor of planting vineyards, and the other arts attendant upon agriculture.

It is alſo related of the ancient Perſians, on the moſt reſpectable authority, that their kings laid aſide their grandeur once every month to eat with huſbandmen. This is a ſtriking inſtance of the high eſtimation in which they held agriculture; for at that time arts were practiſed among that people in great perfection, particularly thoſe of weaving, needle-work, and embroidery. The precepts of the religion taught by their ancient magi, or prieſts, included the practice of agriculture. The *ſaint* among them was obliged to work out his ſalvation by purſuing all the labours of agriculture: And it was a maxim of the Zendaveſta, that he who ſows the ground with care and diligence, acquires a greater degree of religious merit, than he could have gained by the repetition of ten thouſand prayers.

The Phenicians, ſo well known in ſcripture by the name of *Philiſtines*, were alſo remarkable for their attention to, and ſkill in agriculture. But finding themſelves

ſelves too much diſturbed and confined by the incurſions and conqueſts of the Iſraelites, they ſpread themſelves throughout the greateſt part of the Mediterranean iſlands, and carried with them their knowledge in the arts of cultivation.

Mago, a famous general of the Carthaginians, is ſaid to have written no leſs than 28 books on the ſubject; which Columella tells us were tranſlated into Latin by the expreſs order of the Roman ſenate. We are informed by the ancient writers, that Ceres was born in Sicily, where ſhe firſt invented the arts of tillage and of ſowing corn. For this eſſential ſervice, ſhe was, agreeably to the ſuperſtition of thoſe ages, deified, and worſhipped as the goddeſs of plenty. The truth of this is, that in the time of Ceres, the iſland, through her endeavours and the induſtry of the people, became very fruitful in corn; and agriculture was there eſteemed ſo honourable an employment, that even their kings did not diſdain to practiſe it with their own hands.

But time, which at firſt gave birth to arts, often cauſed them to be forgotten when they were removed from the place of their origin. The deſcendants of Noah, who ſettled in Europe, doubtleſs carried their knowledge of agriculture with them into the regions which they ſucceſſively occupied. But thoſe who took poſſeſſion of Greece were ſuch an uncivilized race, that they fed on roots, herbs, and acorns, after the manner of beaſts. Pelaſgus had taught them the culture of the oak, and the uſe of acorns as food; for which ſervice, we are told, divine honours were paid him by the people.

The Athenians, who were the firſt people that acquired any tincture of politeneſs, taught the uſe of corn to the reſt of the Greeks. They alſo inſtructed them how to cultivate the ground, and to prepare it for the reception of the ſeed. This art, we are told, was taught them by Triptolemus. The Greeks ſoon perceived that bread was more wholeſome, and its taſte more delicate, than that of acorns and the wild roots of the fields; accordingly they thanked the gods for ſuch an unexpected and beneficial preſent, and honoured their benefactor.

As the arts of cultivation increaſed, and the bleſſings they afforded became generally experienced, the people ſoon preferred them to whatever the ravages of conqueſt, and the cruel depredations of ſavage life, could procure. And accordingly we find, that the Athenian kings, thinking it more glorious to govern a ſmall ſtate wiſely, than to aggrandize themſelves, and enlarge the extent of their dominions by foreign conqueſts, withdrew their ſubjects from war, and moſtly employed them in cultivating the earth. Thus, by continued application, they brought agriculture to a conſiderable degree of perfection, and ſoon reduced it to an art.

Heſiod was the firſt we know of among the Greeks who wrote on this intereſting ſubject. According to the cuſtom of the Oriental authors, he wrote in poetry, and embelliſhed his poem with luxuriant deſcription and ſublime imagery. He calls his poem *Weeks and Days*, becauſe agriculture requires exact obſervations on times and ſeaſons.

Xenophon has alſo, in his Oeconomics, remarked, that agriculture is the nurſing mother of the arts. For, ſays he, "where agriculture ſucceeds proſperouſly, there the arts thrive; but where the earth neceſſarily lies uncultivated, there the other arts are deſtroyed."

Other eminent Greek writers upon agriculture were, Democritus of Abdera, Socraticus, Archytas, Tarentinus, Ariſtotle, and Theophraſtus, from whom the art received conſiderable improvements.

The ancient Romans eſteemed agriculture ſo honourable an employment, that the moſt illuſtrious ſenators of the empire, in the intervals of public concerns, applied themſelves to this profeſſion; and ſuch was the ſimplicity of thoſe ages, that they aſſumed no appearance of magnificence and ſplendor, or of majeſty, but when they appeared in public. At their return from the toils of war, the taking of cities, and the ſubduing of hoſtile nations, their greateſt generals were impatient till they were again employed in the arts of cultivation.

Regulus, when in Africa, requeſted of the ſenate to be recalled, leſt his farm might ſuffer, for want of proper cultivation, in his abſence; and the ſenate wrote him for anſwer, that it ſhould be taken care of at the public expence, while he continued to lead their armies.

Cato the cenſor, after having governed extenſive provinces, and ſubdued many warlike nations, did not think it below his dignity to write a Treatiſe on Agriculture. This work (as we are told by Servius) he dedicated to his own ſon, it being the firſt Latin treatiſe written on this important ſubject; and it has been handed down to us in all its purity, in the manner that Cato wrote it.

Varro compoſed a treatiſe on the ſame ſubject, and on a more regular plan. This work is embelliſhed with all the Greek and Latin erudition of that learned author, who died 28 years before the commencement of the Chriſtian æra. Virgil, who lived about the ſame time, has, in his Georgics, adorned this ſubject with the language of the Muſes, and finely illuſtrated the precepts and rules of huſbandry left by Heſiod, Mago, and Varro.

Columella, who flouriſhed in the reign of the emperor Claudius, wrote 12 books on huſbandry, replete with important inſtruction.

From this period to that of the reign of Conſtantine Poganatus, huſbandry continued in a declining ſtate; but that wiſe emperor cauſed a large collection of the moſt uſeful precepts relating to agriculture to be extracted from the beſt writers, and publiſhed them under the title of *Geoponics*. It has been aſſerted, that he made this collection with his own hand; and the truth of the aſſertion is not improbable, as it is well known, that after he had conquered the Saracens and the Arabians, he not only practiſed and encouraged, but ſtudied the arts of peace, fixing his principal attention on agriculture, as their beſt foundation.

After the death of Conſtantine, however, the increaſing attention of the people to commerce, and the ignorance and groſs ſuperſtition of the ages which ſucceeded, ſeems to have rendered agriculture an almoſt neglected ſcience. The irruptions of the northern nations ſoon aboliſhed any improved ſyſtem. Theſe innumerable and enterpriſing barbarians, who over-ran all Europe, were originally ſhepherds or hunters, like the preſent Tartars and the ſavages of America. They contented themſelves with poſſeſſing thoſe vaſt deſerts made

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by their own ravages, without labour or trouble, cultivating only a very fmall fpot near their habitations; and in this trifling hufbandry only the meaneft flaves were employed: fo that the art itfelf, which formerly was thought worthy of the ftudy of kings, was now looked upon as mean and ignoble; a prejudice which is fcarcely effaced at prefent, or at leaft but very lately. —During this period, therefore, we find no veftiges of any thing tolerably written on the fubject. No new attempts were made to revive it, or to improve it, till the year 1478, when Crefcenzio publifhed an excellent performance on the fubject at Florence. This rouzed the flumbering attention of his countrymen, feveral of whom foon followed his example. Among thefe, Tatti, Steffano Auguftino Gallo, Sanfovino, Lauro, and Tarello, deferve particular notice.

At what time agriculture was introduced into Britain, is uncertain. When Julius Cæfar firft invaded this ifland, it was not wholly unknown. That conqueror was of opinion, that agriculture was firft introduced by fome of thofe colonies from Gaul which had fettled in the fouthern parts of Britain, about 100 years before the Roman invafion *.

* Cæfar de Bell Gall. lib. 5. c. 12.

It is not to be expected that we can now be acquainted with many of the practices of thefe ancient hufbandmen. It appears, however, that they were not unacquainted, with the ufe of manures, particularly marle. This we have on the authority of Pliny †, who tells us, that it was peculiar to the people of Gaul and of Britain; that its effects continued 80 years; and that no man was ever known to marle his field twice, &c.—It is highly probable, too, that lime was at this time alfo ufed as a manure in Britain, it being certainly made ufe of in Gaul for this purpofe at the time of Julius Cæfar's invafion.

† Plin. Nat Hift. lib. 17 cap. 6.

The eftablifhment of the Romans in Britain produced great improvements in agriculture, infomuch that prodigious quantities of corn were annually exported from the ifland; but when the Roman power began to decline, this, like all the other arts, declined alfo, and was almoft totally deftroyed by the departure of that people. The unhappy Britons were now expofed to frequent incurfions of the Scots and Picts, who deftroyed the fruits of their labours, and interrupted them in the exercife of their art. After the arrival of the Saxons in the year 449, they were involved in fuch long wars, and underwent fo many calamities, that the hufbandmen gradually loft much of their fkill, and were at laft driven from thofe parts of their country which were moft proper for cultivation.

After the Britons retired into Wales, though it appears from the laws made relative to this art, that agriculture was thought worthy of the attention of the legiflature, yet their inftruments appear to have been very unartful. It was enacted that no man fhould undertake to guide a plough who could not make one; and that the driver fhould make the ropes of twifted willows, with which it was drawn. It was ufual for fix or eight perfons to form themfelves into a fociety for fitting out one of thefe ploughs, providing it with oxen and every thing neceffary for ploughing; and many minute and curious laws were made for the regulation of fuch focieties. If any perfon laid dung on a field with the confent of the proprietor, he was by law allowed the ufe of that land for one year. If the dung was carried out in a cart in great abundance, he was to have the ufe of the land for three years. Whoever cut down a wood, and converted the ground into arable, with the confent of the owner, was to have the ufe of it for five years. If any one folded his cattle, for one year, upon a piece of ground belonging to another, with the owner's confent, he was allowed the ufe of that field for four years.

Thus, though the Britons had in a great meafure loft the knowledge of agriculture, they appear to have been very affiduous in giving encouragement to fuch as would attempt a revival of it; but, among the Anglo-Saxons, things were not at prefent in fo good a ftate. Thefe reftlefs and haughty warriors, having contracted a diftafte and contempt for agriculture, were at pains to enact laws to prevent its being followed by any other than women and flaves. When they firft arrived in Britain, they had no occafion for this art, being fupplied by the natives with all the neceffaries of life. After the commencement of hoftilities, the Saxons fubfifted chiefly by plunder: but having driven out or extirpated moft of the ancient Britons, and divided their lands among themfelves, they found themfelves in danger of ftarving, there being now no enemy to plunder; and therefore they were obliged to apply to agriculture.

The Saxon princes and great men, who, in the divifion of the lands, had received the greateft fhares, are faid to have fubdivided their eftates into two parts, which were called the *in-lands* and the *out-lands*. The inlands were thofe which lay moft contiguous to the manfion-houfe of their owner, which he kept in his own poffeffion, and cultivated by his flaves, uuder the direction of a bailiff, for the purpofe of raifing provifions for the family. The out-lands were thofe at a greater diftance from the houfe, and were let to the *ceorls*, or farmers of thofe times, at very moderate rents. By the laws of Ina king of the weft Saxons, who reigned in the end of the feventh and beginning of the eighth century, a farm confifting of ten hides, or plough-lands, was to pay the following rent: "Ten cafks of honey; three hundred loaves of bread; twelve cafks of ftrong ale; thirty cafks of fmall ale; two oxen; ten wedders; ten geefe; twenty hens; ten cheefes; one cafk of butter; five falmon; twenty pounds of forage; and one hundred eels." From this low rent, the imperfection of agriculture at that time is eafily difcoverable; but it is ftill more fo from the low prices at which land was then fold. In the ancient hiftory of the church of Ely, publifhed by Dr Gale, there are accounts of many purchafes of lands by Ædelwold the founder of that church, and by other benefactors, in the reign of Edgar the Peaceable, in the tenth century. By a comparifon of thefe accounts it appears, that the ordinary price of an acre of the beft land in that part of England, in thofe times, was no more than 16 Saxon pennies, or about four fhillings of our money: a very trifling price, even in comparifon with that of other commodities at the fame time: for, by comparing other accounts, it appears, that four fheep were then equal in value to an acre of the beft land, and one horfe of the fame value with three acres. The frequent and deplorable famines which afflicted England about this time, are further inftances of the wretched ftate of agriculture. In 1043, a quarter of wheat fold for

for 60 Saxon pennies (15 of our ſhillings), and at that time equal in value to ſeven or eight pounds of our money now.

The invaſion of the Normans, in 1066, contributed very much to the improvement of agriculture; for, by that event, many thouſands of huſbandmen from Flanders, France, and Normandy, ſettled in Britain, obtained eſtates or farms, and cultivated them after the manner of their country. The implements of huſbandry, uſed at this time, were of the ſame kind with thoſe employed at preſent; but ſome of them were leſs perfect in their conſtruction. The plough, for example, had but one ſtilt or handle, which the ploughman guided with one hand, having in his other hand an inſtrument which ſerved both for cleaning and mending the plough, as well as for breaking the clods. The Norman plough had two wheels; and in the light ſoil of Normandy was commonly drawn by one or two oxen; but, in England, a greater number was often neceſſary. In Wales, the perſon who conducted the oxen in the plough walked backwards. Their carts, harrows, ſcythes, ſickles, and flails, from the figures of them ſtill remaining, appear to have been nearly of the ſame conſtruction with thoſe that are now uſed. In Wales, they did not uſe a ſickle for reaping their corns, but an inſtrument like the blade of a knife, with a wooden handle at each end.—Their chief manure, next to dung, ſeems ſtill to have been marle. Summer fallowing of lands deſigned for wheat, and ploughing them ſeveral times, appear to have been frequent practices of the Engliſh farmers in this period.

We are, after all, very much in the dark with reſpect to the ſtate and progreſs of agriculture in Great Britain previous to the fourteenth century. That it was pretty generally practiſed, eſpecially in the eaſtern, ſouth, and midland parts of England, is certain; but of the mode, and the ſucceſs, we are left almoſt totally ignorant. In the latter end of the fifteenth century, however, it ſeems to have been cultivated as a ſcience, and received very great improvement.

At this time our countryman, Fitzherbert, Judge of the Common-Pleas, ſhone forth with diſtinguiſhed eminence in the practical parts of huſbandry. He appears to have been the firſt Engliſhman who ſtudied the nature of ſoils, and the laws of vegetation, with philoſophical attention. On theſe he formed a theory confirmed by experiments, and rendered the ſtudy pleaſing as well as profitable, by realizing the principles of the ancients, to the honour and advantage of his country. Accordingly, he publiſhed two treatiſes on this ſubject: the firſt, intitled *The Book of Huſbandry*, appeared 1534; and the ſecond, called *The Book of Surveying and Improvements*, in 1539. Theſe books, being written at a time when philoſophy and ſcience were but juſt emerging from that gloom in which they had long been buried, were doubtleſs replete with many errors; but they contained the rudiments of true knowledge, and revived the ſtudy and love of an art, the advantages of which were obvious to men of the leaſt reflection. We therefore find that Fitzherbert's books on Agriculture ſoon raiſed a ſpirit of emulation in his countrymen, and many treatiſes of the ſame kind ſucceſſively appeared, which time has however deprived us of, or at leaſt they are become ſo very ſcarce as only to be found in the libraries of the curious.

About the year 1600, France made ſome conſiderable efforts to revive the arts of huſbandry, as appears from ſeveral large works, particularly *Les Moyens de devenir Riche;* and the *Coſmopolite*, by Bernard de Paliſſy, a poor porter, who ſeems to have been placed by fortune in a ſtation for which nature never intended him; *Le Theatre d'Agriculture*, by Deſerres; and *L'Agriculture et Maiſon Ruſtique*, by Meſſrs Etienne, Liebault, &c.

Nearly in the ſame period, the practice of huſbandry became more prevalent among this people and the Flemings than the publiſhing of books on the ſubject. Their intention ſeemed to be that of carrying on a private lucrative employment, without inſtructing their neighbours. Whoever therefore became deſirous of copying their method of agriculture, was obliged to viſit that country, and make his own remarks on their practice.

The principle idea they had of huſbandry was, by keeping the lands clean and in fine tilth, to make a farm reſemble a garden as nearly as poſſible.

Such an excellent principle, at firſt ſetting out, led them of courſe to undertake the culture of ſmall farms only, which they kept free from weeds, continually turning the ground, and manuring it plentifully and judiciouſly. When they had by this method brought the ſoil to a proper degree of cleanlineſs, health, and ſweetneſs, they chiefly cultivated the more delicate graſſes, as the ſureſt means of obtaining a certain profit upon a ſmall eſtate, without the expence of keeping many draught horſes and ſervants. A few years experience was ſufficient to convince them, that ten acres of the beſt vegetables for feeding cattle, properly cultivated, would maintain a larger ſtock of grazing animals than forty acres of common farm graſs on land badly cultivated. They alſo found, that the beſt vegetables for this purpoſe were lucerne, ſaintfoin, trefoil of moſt kinds, field turnips, &c.

The grand political ſecret of their huſbandry, therefore, conſiſted in letting farms on improvement. They are ſaid alſo to have diſcovered nine ſorts of manure; but what they all were, we are not particularly informed. We find, however, that marle was one of them; the uſe and virtues of which appear alſo to have been well known in this kingdom two hundred years ago, although it was afterwards much neglected. They were the firſt people among the moderns who ploughed in green crops for the ſake of fertilizing the ſoil; and who confined their ſheep at night in large ſheds built on purpoſe, the floors of which were covered with ſand or virgin earth, &c. which the ſhepherd carted away each morning to the compoſt dunghill.

In England, during the civil wars, though the operations and improvements in huſbandry ſuffered ſome temporary checks, there flouriſhed ſeveral excellent writers on the ſubject, and the art itſelf received conſiderable encouragement. Sir Hugh Platt was one of the moſt ingenious huſbandmen of the age in which he lived; yet ſo great was his modeſty, that all his works, except his Paradiſe of Flora, ſeem to be poſthumous. He held a correſpondence with moſt of the lovers and patrons of agriculture and gardening in England; and ſuch was the juſtice and modeſty of his temper, that he always named the author of every diſcovery communicated to him. Perhaps no man in any age diſcovered, or at

leaſt

leaſt brought into uſe, ſo many new kinds of manure. This will be evident to thoſe who read his account of the compoſt and covered dung-hills, and his judicious obſervations on the fertilizing qualities lodged in ſalt, ſtreet-dirt, and the ſullage of ſtreets in great cities, clay, fuller's earth, mooriſh earths, dung-hills made in layers, fern, hair, calcination of all vegetables, malt-duſt, willow-tree earth, ſoaper's aſhes, urine, marle, and broken pilchards.

Gabriel Plattes may be ſaid to have been an original genius in huſbandry. He began his obſervations at an earlier period, in the reign of Queen Elizabeth, and continued them down to the Commonwealth. But notwithſtanding the great merit of this writer, and the eſſential ſervice he had rendered his country by his writings, the public ungratefully ſuffered him to ſtarve and periſh in the ſtreets of London; nor had he a ſhirt on his back when he died.

Samuel Hartlib, a celebrated writer on agriculture in the laſt century, was highly eſteemed and beloved by Milton, and other great men of his time. In the preface to his work intitled *His Legacy*, he laments that no public director of huſbandry was eſtabliſhed in England by authority; and that we had not adopted the Flemiſh method of letting farms upon improvement. This remark of Hartlib's procured him a penſion of L. 100 a-year from Cromwell; and the writer afterwards, the better to fulfil the intention of his benefactor, procured Dr Beatti's excellent annotation on the Legacy, with other valuable papers from his numerous correſpondents.

The time in which Hartlib flouriſhed ſeems to have been an æra when the Engliſh huſbandry roſe to great perfection, compared with that of former ages; for the preceding wars had impoveriſhed the country gentlemen, and of courſe made them induſtrious. They found the cultivation of their own lands to be the moſt profitable ſtation they could fill. But this wiſe turn was not of long continuance. At the Reſtoration, they generally became infected with that intoxication and love of pleaſure which ſucceeded. All their induſtry and knowledge were exchanged for neglect and diſſipation; and huſbandry deſcended almoſt entirely into the hands of common farmers.

Evelyn was the firſt writer who inſpired his countrymen with a deſire of reviving the ſtudy of agriculture; and he was followed by the famous Jethro Tull. The former, by his admirable treatiſes on earth and on planting, and the latter, by ſhowing the ſuperior advantages of the drill-huſbandry, excited numbers to bring their theory to the teſt of fair experiment.

Many valuable and capital improvements have, ſince that period, been made in Engliſh huſbandry: and theſe great men have been ſucceeded by a variety of writers, many of whom have done eſſential ſervice, by enlightening the minds of their countrymen, and exciting them to emulation.

About the middle of the laſt century, Ireland began to make a conſiderable figure in the art of huſbandry. It muſt indeed be confeſſed, that the Iriſh had very ſtrong prejudices in favour of a wretched method of agriculture, till Blyth opened their eyes by his excellent writings. Since that time, a ſpirit of improvement has more or leſs been promoted, and in many inſtances carried on with great zeal, by the nobility, clergy, and gentry of that kingdom. In proof of this, it will be ſufficient to obſerve, that the Tranſactions of the Dublin Society for encouraging Huſbandry are now cited by all foreigners in their memoirs relating to that ſubject. And the obſervations of that diſcerning and judicious writer, Arthur Young, Eſq; in his late Tour through that kingdom, ſhow, that in many reſpects improvements there have of late years made a progreſs nearly as rapid as in England.

After the peace of Aix-la-Chapelle, moſt of the nations of Europe, by a ſort of tacit conſent, applied themſelves to the ſtudy of agriculture, and continued to do ſo, more or leſs, amidſt the univerſal confuſion that ſucceeded.

The French found, by repeated experience, that they could never maintain a long war, or procure a tolerable peace, unleſs they could raiſe corn enough to ſupport themſelves in ſuch a manner as not to be obliged to harſh terms on the one hand, or to periſh by famine on the other. This occaſioned the King to give public encouragement to agriculture, and even to be preſent at the making of ſeveral experiments. The great, and the rich of various ranks and ſtations, followed his example; and even the ladies were candidates for a ſhare of fame in this public-ſpirited and commendable undertaking.

During the hurry and diſtreſſes of France in the war of 1756, conſiderable attention was paid to agriculture. Prize-queſtions were annually propoſed in their rural academies, particularly thoſe of Lyons and Bourdeaux; and many judicious obſervations were made by the Society for improving agriculture in Brittany.

Since the concluſion of that war in 1760, matters have been carried on there with great vigour. The univerſity of Amiens made various propoſals for the advancement of huſbandry; and the Marquis de Tourbilly (a writer who proceeded chiefly on experience) had the principal direction of a Georgical ſociety eſtabliſhed at Tours.

The ſociety at Rouen alſo deſerves notice; nor have the King and his miniſters thought it unworthy their attention. There are at preſent about fifteen ſocieties exiſting in France, eſtabliſhed by royal approbation, for the promoting of agriculture; and theſe have twenty co-operating ſocieties belonging to them.

About this time vigorous exertions began to be made in Ruſſia to introduce the moſt approved ſyſtem of huſbandry which had taken place in other parts of Europe. The preſent Empreſs has ſent ſeveral gentlemen into Britain and other countries to ſtudy agriculture, and is giving it all poſſible encouragement in her own dominions.

The art of agriculture has alſo been for near 30 years publicly taught in the Swediſh, Daniſh, and German univerſities, where the profeſſors may render effectual ſervice to their reſpective countries, if they underſtand the practical as well as the ſpeculative part, and can converſe with as much advantage with the farmer as with Virgil and Columella.

Even Italy has not been totally inactive. The Neapolitans of this age have condeſcended to recur to the firſt rudiments of revived huſbandry, and begun to ſtudy anew the Agricultural Syſtem of Creſcenzio, firſt publiſhed in 1478. The people of Bergamo have purſued

ſued the ſame plan, and given a new edition of the Ricordo d'Agriculturæ de Tarello, firſt publiſhed in 1577. The dutchy of Tuſcany have imbibed the ſame ſpirit for improvement. A private gentleman, above 40 years ſince, left his whole fortune to endow an academy of agriculture. The firſt eccleſiaſtic in the dutchy is preſident of this ſociety, and many of the chief nobility are members.

His Sardinian Majeſty has alſo ſent perſons to learn the different modes of practice in foreign countries; and made ſome ſpirited attempts to eſtabliſh a better method of agriculture among his ſubjects.

In Poland, alſo, M. De Bieluſki, grand marſhal of the crown, has made many ſucceſsful attempts to introduce the new huſbandry among his countrymen; and procured the beſt inſtruments for that purpoſe from France, England, and other parts of Europe.

The Hollanders are the only people now in Europe who ſeem to look upon agriculture with indifference. Except the ſingle collateral inſtance of draining their fens and moraſſes, they have ſcarcely paid any attention to it; and even this ſeems to have proceeded more from the motive of ſelf-preſervation than any love of, or diſpoſition to, huſbandry.

In the year 1759, a few ingenious and public-ſpirited men at Berne in Switzerland eſtabliſhed a ſociety for the advancement of agriculture and rural œconomics. In that ſociety were many men of great weight in the republic, and moſt of them perſons of a true caſt for making improvements in huſbandry, being enabled to join the practice with the theory.

Nor muſt we here omit to mention, that the juſtly celebrated Linnæus and his diſciples have performed great things in the north of Europe, particularly in diſcovering new kinds of profitable and well-taſted food for cattle. About the ſame time, Sweden beſtowed ſucceſsful labours on a ſoil which had before been looked upon as cold, barren, and incapable of melioration. Of this the Stockholm Memoirs will be a laſting monument.

Denmark, and many of the courts in Germany, followed the ſame example. Woollen manufactures were encouraged, and his Daniſh Majeſty ſent three perſons into Arabia Felix to make remarks, and bring over ſuch plants and trees as would be uſeful in huſbandry, building, and rural affairs.

The duchy of Wirtemburgh, alſo, a country by no means unfertile, but even friendly to corn and paſturage, has contributed its aſſiſtance towards the improvement of agriculture, having more than 30 years ſince publiſhed 14 œconomical relations at Stutgard.

Neither muſt we forget the very aſſiduous attention of the learned in Leipſic and Hanover to this important object. During the rage and devaſtation of a long war, they cultivated the arts of peace; witneſs the *Journal d'Agriculture* printed at Leipſic, and the *Recueils d'Hanover* printed in that city.

Even Spain, conſtitutionally and habitually inactive on ſuch occaſions, in ſpite of all their natural indolence, and the prejudices of bigotry, invited Linnæus, with the offer of a large penſion, to ſuperintend a college founded for the purpoſe of making new enquiries into the hiſtory of Nature and the art of agriculture.

Among the Japaneſe, agriculture is in great repute; and among the Chineſe it is diſtinguiſhed and encouraged by the court beyond all other ſciences. The Emperor of China yearly, at the beginning of ſpring, goes to plough in perſon, attended by all the princes and grandees of the empire. The ceremony is performed with great ſolemnity; and is accompanied with a ſacrifice, which the emperor, as high-prieſt, offers to Chang-Ti, to enſure a plentiful crop in favour of his people.

But, without any improper partiality to our own country, we are fully juſtified in aſſerting, that Britain alone exceeds all modern nations in huſbandry; and from the ſpirit which for the laſt twenty years has animated many of our nobility and gentry, to become the liberal patrons of improvement, there is reaſon to hope that this moſt uſeful of arts will, in a few years, be carried to a greater pitch of perfection than it has ever yet attained in any age or country.—The Royal Society, the Bath Society, and the Society of Arts, &c. in particular, have been ſignally uſeful in this reſpect; and the other aſſociations, which are now eſtabliſhed in many parts of the kingdom, co-operate with them in forwarding their laudable deſign.

It is not, however, to the exertion of public ſocieties, excellent and honourable as they are, that all our modern improvements in agriculture owe their origin. To the natural genius of the people have been added the theory and practice of all nations in ancient and modern times. This accumulated maſs of knowledge has been arranged, divided, and ſubdivided; and after paſſing the teſt of practical experiments, the eſſential and moſt valuable parts of it have been preſerved, improved, and amply diffuſed in the works of Lord Kames, Mr Young, Stillingfleet, Dr Hunter, Anderſon, Dickſon, Ellis, Randal, Liſle, Marſhal, Mortimer, Duhamel, Bradley, Kent, Mills, and a few other writers upon this great art of rendering mankind happy, wealthy, and powerful.

PART I. THEORY OF AGRICULTURE.

IN an art ſo extenſively uſeful to mankind, and which has been ſo univerſally practiſed ſince the creation of the world, it is natural to expect the moſt exact and perfect theory. But in this we are totally diſappointed.

1 Ignorance of the food of vegetables, the reaſon of imperfection in the theory of agriculture.

One reaſon of this want of a diſtinct theory of agriculture is, the ignorance of what is properly the food of vegetables; for as the art of agriculture conſiſts principally in ſupplying them with a proper quantity of food, in the moſt favourable circumſtances, it is evident, we might proceed upon a much ſurer foundation if we could aſcertain what their proper nouriſhment is, than we can do without this knowledge. —The reaſon of the great differences regarding the practice, probably, is the difficulty of making experiments in agriculture. It is not in this art as in Mechanics, Chemiſtry, &c. where an experiment can be made in an hour, or a day or two at fartheſt: an experiment in agriculture cannot be properly made in leſs than ſeveral years. Some favourable unobſerved circumſtances, quite foreign to the experiment itſelf, may concur to produce plentiful crops for a year or two: and

Theory.

and thus the farmer may be induced to publiſh his fancied improvements; which failing in the hands of others, or perhaps even in his own on a repetition of the experiment, the new improvements are totally neglected, and things continue in their old way. Were he, however, capable of ſeeing and handling the food of vegetables, as well as he can do that of a horſe or an ox, and procuring it in any imaginable quantity, it is plain, that he would be able to cauſe vegetables grow in their utmoſt luxuriancy, or, if we may be allowed the expreſſion, *fatten* them, with as great certainty as he can fatten a horſe or an ox, when he hath plenty of proper food to give them.—To aſcertain what this food is, therefore, muſt be a ſtep towards the perfection of agriculture; and to this we ſhall contribute our endeavour.

Sect. I. *Of the proper Food of Plants.*

2 Various ſuppoſitions concerning the food of plants.

We ſhall not here ſpend time in refuting the theories of thoſe who imagined the vegetable food to conſiſt of oily and ſaline ſubſtances. A more probable ſuppoſition has been, That Water and Air are the proper vegetable food, to which alone they owe their increaſe in bulk and weight.—That plants cannot be ſupported without both theſe, is very certain: but we know, that air is a compound fluid; and water is never without ſome impurities, ſo may alſo be conſidered as a compound.—Is it then the aqueous, the earthy, the acid, or the phlogiſtic part of the air, which nouriſhes plants? In like manner, is it the pure elementary part of water which nouriſhes them? or does it contribute to their growth only by the heterogeneous ſubſtances which it contains?

3 Vegetables thrive in putrid air.

From Dr Prieſtley's experiments on different kinds of air, it appears that the pureſt kind of that fluid is not the fitteſt for the purpoſes of vegetation. On the contrary, vegetables flouriſhed in a ſurpriſing degree when confined in a ſmall quantity of air made perfectly noxious by the putrid effluvia of animal bodies.—Hence it appears probable, that ſuch effluvia, or, in other words, the eſſence of corrupted matter, conſtitute at leaſt one ſpecies of vegetable food; and when vegetables are put into ſuch circumſtances that the ſteams of putrefying bodies can have acceſs to them, we are ſure they will thrive the better.

4 Water capable of imbibing putrid effluvia.

The Doctor alſo found, that by agitating putrid air in water, part of which was expoſed to the atmoſphere, the water acquired a very putrid noxious ſmell; which ſhows, that water, as well as air, is capable of abſorbing thoſe effluvia which are found proper food for vegetables. We cannot help concluding, therefore, that in the continual aſcent of water in vapour, and its deſcent again in rain, which is a much more effectual *agitation* than could be made by Dr Prieſtley, the water muſt be very intimately combined with the *phlogiſtic* or putrid effluvia which are contained in the air. To this union we are led ſtrongly to ſuſpect that rain-water owes its fertilizing qualities; for the pureſt ſpring waters, though moſt wholeſome for animals, are not found to be fitteſt for promoting the growth of vegetables.—As, therefore, vegetables evidently receive nouriſhment both by their leaves and roots, and increaſe remarkably in bulk by abſorbing the putrid effluvia from the air; and as

5 Putrid effluvia the proper food of plants.

they likewiſe increaſe in bulk by admitting water to their roots, and more ſo when the water contains much of that kind of effluvium than when it contains leſs: ſo we would conclude, that the nouriſhment received by the roots of plants is of the ſame kind with that received by their leaves; and that this food may be given them in greater plenty than they naturally receive it, by impregnating the air which ſurrounds them, or the water which moiſtens them, with a greater quantity of putrid matter than what they contain in a natural ſtate.

Sect. II. *The foregoing Theory confirmed from conſiderations on the nature of vegetable Mould, and the different kinds of Manure found proper for fertilizing the Soil.*

Though plants will grow on any kind of earth, and flouriſh vigorouſly, if plentifully ſupplied with water; yet ſome kinds of ſoil are found much more proper for ſupplying them with nouriſhment than others.—We cannot, indeed, allow the inferences to be quite fair which ſome would draw from experiments on plants ſet in mere ſand, &c.; viz. that the earth is of no other uſe to vegetation than to afford a proper ſupport to the plant, that it be not eaſily moved out of its place; becauſe the experiments made on ſingle vegetables are always performed in or very near houſes, where the air is by no means ſo pure as in the open fields, and conſequently where they have an opportunity of receiving as much nouriſhment from the air as may compenſate the want of what they would have derived from the earth if planted in a rich ſoil. Lord Kames, in the Gentleman Farmer, mentions an experiment wherein a pea was planted on ſome cotton ſpread on water, in a phial. It ſprung, and puſhed roots through the cotton into the water. The plant grew vigorouſly, and, at the time of his writing the experiment, carried large pods full of ripe ſeed.—From this experiment, or others of a ſimilar kind, however, a farmer would not be thought to act very judiciouſly, who ſhould conclude that nothing more was requiſite to produce a plentiful crop, than to keep his fields conſtantly ſoaking with water, and apply his labour only for that purpoſe, without regarding either tillage, manure, or the difference of ſoils. Experience has abundantly ſhown, that by certain operations performed on the earth itſelf, it is rendered much more capable of ſupplying vegetables with plenty of nouriſhment than if ſuch operations were omitted; and that ſome kinds of ſoils cannot without certain additions be rendered ſo fit for this purpoſe as others; and this is what conſtitutes the difference between a *rich* and a *poor* ſoil. 6 All kinds of earth not equally proper for nouriſhing vegetables.

That ſpecies of earth which is capable of ſupplying the vegetable kingdom with nouriſhment in the greateſt plenty, is found beſt in well cultivated gardens. It is not, however, even in theſe, found in perfect purity; being conſtantly mixed with greater or leſs proportions of ſand, ſmall ſtones, &c. It can be had by itſelf, and entirely ſeparated from all other ſubſtances, only by ſuffering vegetable or animal bodies to putrefy. By undergoing this operation, they are at laſt reſolved into a kind of earth, which appears perfectly the ſame, from whatever ſubſtance it is produced. Of this earth Dr Lewis gives us the following characters. It is indiſſoluble 7 Of the true vegetable earth.

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diſſoluble in acids, ſomewhat tenacious when moiſtened with water, friable when dry, and acquires no additional hardneſs in the fire.—The chemiſtry of nature, and that of art, however, are ſo very diſſimilar, that an account of the chemical properties of this earth can be but of very little ſervice to the practice of agriculture; however, to thoſe above mentioned we may add, that when it is diſtilled with a violent fire, a volatile alkaline ſpirit, and fœtid oil, ſimilar to thoſe of hartſhorn or other animal ſubſtances, are obtained.

8 This earth impregnated with putrid effluvia.

As the volatile alkali is known to be produced in great plenty by diſtilling putrid ſubſtances either animal or vegetable, the obtaining an alkaline ſpirit from this kind of earth is a ſtrong argument of its being much impregnated with the putrid effluvium, which we have already mentioned as the proper vegetable food contained in the air and water. Indeed, conſidering that this kind of earth is produced by putrefaction, it is next to an impoſſibility that it ſhould not be impregnated with putrid ſteams, as much as earth can be; and if the earth which is moſt impregnated with theſe ſteams is found to afford the greateſt quantity of nouriſhment to vegetables, we have from thence an additional proof that they live on the putrid matter emitted from dead animals and vegetables like themſelves.

9 Earth is capable of abſorbing putrid ſteams in prodigious quantities.

That we may be the more aſcertained of this, it muſt be conſidered, that the earth, which undoubtedly is the great ſource of nouriſhment to vegetables, is capable of abſorbing putrid effluvia more powerfully, or at leaſt in much greater quantity, before it is ſaturated, than either the air or water. The practice of burying dead bodies is an undeniable proof of this. They are laid but a ſmall depth under ground; yet the abominable ſtench emitted by the carcaſe is retained in the earth, ſo that it never penetrates in ſuch a manner as to be offenſive. That earth may be ſaturated with this putrid matter, as well as air or water, is very certain; and, in caſe of ſuch a ſaturation, no doubt either of theſe will take up the ſuperfluous quantity, and become noxious: but unleſs the earth is fully ſaturated, both of them will depoſite part of what they themſelves contain in the earth, and by that means become more ſalutary than they were before.

10 Agreeable odour emitted by moiſt earth.

That earth is capable of attracting putrid effluvia from the air, perhaps, may not be ſo readily granted; and indeed we know of no experiment whereby it can be ſhown that putrid air is made ſalutary by having any kind of earth agitated in it: but if we conſider the exceeding great ſalubrity of the air in the country, and the healthineſs of thoſe who follow the plough or are employed in digging the ground, we muſt at leaſt allow, that when the ground is turned up, it communicates no kind of noxious quality to the air; which it would certainly do, if it emitted a putrid effluvium. So far from this, the ſmell of moiſt earth is always agreeable and wholeſome; and here we have the ſatisfaction to find our theory ſomewhat confirmed by the celebrated Baron van Swieten, late phyſician to the empreſs of Hungary.

"Phyſicians," ſays he, "uſually adviſe their patients to ruſtication, not only that they may enjoy a pure and freely circulating air; but that, as their ſtrength increaſes, they may, diſengaged from all care, exerciſe their body by the ſlighter labours of agriculture, and other country amuſements.

"There may perhaps be another cauſe why ruſtication will be of benefit in conſumptions. It is well known, that, after ſome days drought, on the falling of rain that moiſtens the earth, there ariſes a grateful ſmell, which we all are ſenſible of; and this is commonly attributed to the vegetables, which before ſapleſs, but now refreſhed by rain, perſpire more copiouſly. But Reaumur obſerved, that a like fragrancy is alſo perceptible after rain when the corn has been cut down in the fields, where there only remains dry ſtubble; and examining the matter more particularly, he found that dry earth is without ſmell, but as ſoon as it is moiſtened to the degree of having the conſiſtence of ſoftiſh pap, it then diffuſes a ſtrong ſmell; but if more water is added, the ſmell is diminiſhed, nay even quite diſſipated. Neither does it ſeem an eaſy matter to exhauſt that power of producing ſmells which the earth is poſſeſſed of. Every day, during a fortnight, he made cakes of moiſtened earth; and having dried and wetted them over again, he could not perceive that the earth was leſs fragrant after all theſe repeated experiments, if it was again wetted. He further obſerved, that this fragrancy does not diffuſe itſelf to any thing at a great diſtance, without being much diminiſhed, and ſoon entirely gone.—It has been obſerved, that this exſpiration of the earth ceaſes if thunder and ſtorms ſoon follow: while they continue, it begins to return; and when over, the ſame fragrancy of the earth for ſome hours affects the ſmell of a man as he walks along over a conſiderable tract of ground. There is no one, I believe, but has ſometimes made this obſervation; and hence the earth, when moiſtened to a certain degree, ſeems to exhale fragrant odours, and indeed various in various places, as we are ſenſible of from their diverſity. They are for the moſt part of a ſalubrious quality; as ſome perſons quite faint and languid in the ſummer-heats perceive themſelves wonderfully refreſhed, whilſt, after rain, they ſnuff up the fragrant odour. In ſome places thoſe effluvia are perhaps bad, and may be the cauſes of diſeaſes."

This property of emitting a fragrant ſmell is likewiſe taken notice of by Dr Home in his Principles of Agriculture and Vegetation. Some phyſicians have preſcribed a bath of earth for the cure of conſumptive patients; and Dr Solano de Luque was of opinion, that the earth had the property of abſorbing contagious miaſmata into it: but whether it can abſorb theſe miaſmata from living bodies or not, it certainly can abſorb them from dead ones; for a piece of putrid meat will be much ſweetened by lying for a ſhort time in the ground.

11 Power of tranſmutation in the earth aſſerted.

From all this we cannot indeed infer, that putrid air is ſweetened by mere earth; but we diſcover what is perhaps more important, namely, that though earth is the common receptacle of all putrid matters both animal and vegetable, there is a change made on them when in it, which cannot be made either by air or water. Thus, if the carcaſe of a ſmall animal is left to putrefy in the air, it becomes exceedingly offenſive, and continues ſo from firſt to laſt. The ſame thing happens if it is left to putrefy in water. But, in earth, the caſe is quite different. After the carcaſe is conſumed, the earth which has imbibed all the putrid ſteams, inſtead of exhaling an offenſive odour, diffuſes an agreeable one; and thus we may ſee that it is endued with a power no leſs remarkable than that of attraction

traction or repulſion, and which we may diſtinguiſh by the name of *tranſmutation*. With regard to water, the caſe is more evident; for the moſt putrid water will be ſweetened by percolation through earth, or even running in a channel for ſome time on its ſurface; but if it contains any impurities of the ſaline kind, they will not be ſeparated, or at leaſt in very ſmall quantity.

12
Attraction inſufficient to ſolve the phenomena of vegetation.

The exiſtence of ſuch a power as that of tranſmutation we will be obliged to own, whatever we imagine the vegetable food to conſiſt of; for it is impoſſible to ſolve the phenomena of vegetation by attractions and repulſions. If we ſuppoſe the vegetable food to be ſalt, let us attract and repel ſalt as we will, it remains ſalt from firſt to laſt. Let us ſuppoſe it water, the caſe is the ſame; and, by mere attraction, nothing but maſſes of ſalt, or pools of water, could be produced. The caſe is the ſame on our own hypotheſis; for, ſuppoſing plants compoſed of the putrid effluvia of others, and of dead animals, if nature was endued with no other power than attraction or repulſion, the vegetable would neceſſarily be a corrupted maſs like that of which it was compoſed.—This power, as we have already ſeen, reſides only in the earth, and in the vegetables themſelves; air and water can indeed act as powerful ſolvents, but cannot transform or compound.

13
Confirmation of the above theory from the different operations of agriculture.

We muſt next conſider the nature of thoſe different operations, which, from time immemorial, have been performed on the earth, in order to cauſe it produce the greateſt crops of vegetables. If all of theſe ſhall be found conſpiring to one general purpoſe, then the ſhorteſt and moſt eaſy method of attaining that purpoſe is undoubtedly the moſt proper to be practiſed in agriculture, whether it hath been as yet put in execution or not. Theſe are,

14
Fallowing.

1. *Frequent ploughing, or fallowing.* The immediate conſequences of this is to expoſe different quantities of the ſoil to the action of the air and ſun, which will not fail to exert their ſolvent powers upon it. In conſequence of this action, the earth is partly reduced to powder; many of the roots of vegetables, with which it always abounds, are diſſolved and putrefied; and the earth produced from them mixes with the reſt, as well as the effluvia they emit during their diſſolution. The earth ſoon begins again to exert its prolific powers, and a crop of vegetables is produced. By a repetition of the ploughing, theſe are turned with their roots upwards, are expoſed to the ſolvent powers of the air and light; in conſequence of which they die, are putrefied, and more of the native ſoil is reduced to powder, and mixed with them. By a frequent repetition of this proceſs, the ſoil becomes vaſtly more tender, and approaches to the nature of garden-mould, and its fertility is conſiderably increaſed.

15
The capacity of a ſoil to retain water not increaſed by fallowing.

Lord Kames is of opinion, that the reaſon of the fertility of any ſoil being increaſed by fallowing, is, that its capacity of retaining water is increaſed. But this cannot be admitted; for ſo far from being more diſpoſed to retain water by its pulveriſation, the ſoil is evidently more diſpoſed to part with it, either by evaporation, or by ſuffering the moiſture to percolate thro' it. In this reſpect it is far inferior to clay; for though dry garden-mould abſorbs water much more quickly than clay, it alſo dries much ſooner, and thus all the advantage is loſt.

16
Oils and ſalts not the true vegetable food.

To thoſe who reckon the food of vegetables to conſiſt of oils or ſalts, the operation of fallowing ground muſt appear an uſeleſs one, as it can tend neither to produce oils nor ſalts, but to deſtroy them. As its utility, however, cannot be denied, the favourers of this theory imagine, that the ground, by repeated operations of this kind, is fitted for attracting the nitrous ſalts from the air: but it is found, that theſe ſalts cannot be attracted by earth, or any other ſubſtance, even when expoſed for a great length of time to the air with a view to produce ſalt-petre; which gives a ſtrong ſuſpicion againſt their exiſtence; and even if nitre is mixed with the ſoil, it is found to be detrimental, and will kill or poiſon plants inſtead of nouriſhing them.

17
Overflowing the ſoil with water.

2. *Overflowing the ground with water.*—This is found prodigiouſly to increaſe the fertility of any ſoil. It is well known how much Egypt owes to the annual overflowing of the Nile; and even in this country the overflowing of any ground is found to be attended with great advantage. This is practiſed by Mr Bakewell of Leiceſterſhire, famous for his improvements in the breed of cattle; and he finds it fully to anſwer an annual manuring of any other ſort. It is alſo recommended by Mr Anderſon of Monkſhill, in his Eſſays on Agriculture.

18
Reaſons of the increaſe of fertility by the overflowing.

The fertilizing quality of water will eaſily be accounted for on the ſame principles. When grown vegetables are covered with water, their growth, however vigorous before, is immediately ſtopt, unleſs they be of the aquatic kind: they die, are diſſolved, and putrefied; in which caſe, their finer parts are undoubtedly abſorbed by the earth: and thus the *floating*, as it is called, of fields with water, anſwers the purpoſe of fallowing, with very little trouble. This is not all: for ſtagnating water always depoſites a ſediment, which mixing with the diſſolved parts of the vegetables all over the field, forms an excellent manure; and when the water is allowed to run off, the heat of the ſun ſoon brings the higheſt degree of putrefaction on the dead vegetables; the effluvia of which, mixing with the mud depoſited from the water, makes it exceedingly rich.

19
Oils & ſalts cannot be the vegetable food.

Upon the ſuppoſition of oily and ſaline food for vegetables, this operation muſt certainly be prejudicial; for nothing can ſo effectually deprive any ſubſtance of ſalt as ſteeping it in water. Neither will water either depoſite oil from itſelf, or ſuffer it to mix with the ground if accidentally brought to it; nay, though a field were previouſly impregnated with oil, upon overflowing it with water great part of the oil would be ſeparated, and riſe to the top: ſo that, in either caſe, this operation could not fail to impoveriſh land rather than enrich it; and as vegetables are found to be ſupplied with food in plenty by an operation which muſt undoubtedly tend to take away both oils and ſalts from them, we cannot help thinking this a demonſtration, that their food is compoſed neither of oil nor ſalt.

20
Of manures, and their operation.

3. *Manuring*, or mixing the ſoil with different ſubſtances.—We ſhall here confine ourſelves to thoſe which are of undoubted efficacy, and have their credit eſtabliſhed by long experience. Theſe are, 1. lime, chalk, marle, ſhells, or other earths, called by the chemiſts *calcareous earths*; 2. ſoot; 3. aſhes: 4. dung of different kinds.—(1.) The lime, chalk, marle, and ſhells, are all found to be of the ſame nature. The marle differs from the reſt, only in having a mixture of clay along

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along with its calcareous part. Thefe contain neither falt nor oil of any kind; they readily imbibe water, and as readily part with it. Quicklime, indeed, retains water very obftinately: but fuch lime as is laid upon the ground foon returns to the fame ftate in which it originally was; and powdered limeftone is found to anfwer as well for the purpofes of manure as that which has been burnt; fo that here we may confider them all as fubftances of the fame clafs.—If any of thefe fubftances are mixed with dead animal or vegetable bodies, they remarkably quicken their diffolution and corruption, as appears from Sir John Pringle's experiments on putrefaction. When mixed with the foil, therefore, they muft undoubtedly exert their powers on fuch fubftances as they find there, in the fame manner as they do on others; that is, they muft haften their diffolution and putrefaction, and give the pure vegetable mould an opportunity of abforbing their putrid fteams, and confequently of being fertilized by it in the fame manner as by putrid fubftances of any kind. (2.) Thofe who contend for oily and faline principles in the vegetable food, avail themfelves of the ufefulnefs of foot as a manure; which is not only oily of itfelf, but affords a great quantity of volatile falt, along with fome neutral fal-ammoniac. It muft be remembered, however, that not an atom either of volatile falt or fal-ammoniac can be extracted from foot without a confiderable heat, which no foil can give, nor could any vegetable bear. Neither doth its oil appear without a great degree of heat: and though it feels fomewhat unctuous to the touch, this is but a mere deception; for no true oil, capable of floating on water, can be obtained from foot without diftillation. It is impoffible, therefore, that foot can act upon the foil either as an oily or a faline fubftance; how far it is capable of diffolution by putrefaction, or being otherwife converted into an earth, hath not yet been determined by experiments; but as it yields, on diftillation, the fame principles which are obtained from animal or putrefied vegetable fubftances, it is probable that foot enriches the ground in the fame manner that they do. (3.) The ufe of afhes in manure is likewife urged as an argument for the food of vegetables being of a faline nature; as it is known, that the common alkaline falts are procured by lixiviating the afhes of wood and other vegetables. Experience, however, fhows us, that afhes are no lefs fit for manure after the falt is extracted from them than before. Indeed, if there be any difference, it is in favour of the wafhed afhes. The alkali itfelf, though in Sir John Pringle's experiments it was found to be *antifeptic*, or a refifter of putrefaction, is neverthelefs a powerful diffolvent; and as it muft foon lofe its alkaline properties when mixed with the earth, in confequence of the univerfal exiftence of the vitriolic acid, thofe fubftances which it has diffolved will be more difpofed to putrefaction than before, and confequently tend to fertilize the ground in the manner we have already defcribed. The wafhed afhes are *feptics*, or promoters of putrefaction, and confequently act in the fame manner as chalk or limeftone. (4.) All kinds of dung are fo much difpofed to putrefaction, that it is difficult to imagine any other way in which they can be ferviceable to vegetation than by their putrid effluvia.—People indeed may dream of imaginary falts in dung; but if they knew or confidered the difficulty of procuring falt of any kind from dung, they would probably alter their fentiments. The volatile falts procured from this as well as other animal matters, are mere creatures of the fire: putrid urine produces them indeed without heat, but fcarce any other animal fubftance. Neverthelefs, other putrid fubftances will fertilize the ground as well as urine, and therefore muft act in fome other way than by their falts. Though Dr Prieftley's experiments had never been made, we could have formed no other rational fuppofition concerning the manner in which putrid fubftances fertilize the earth, than what we have already done; but as he has fhown that vegetables are prodigioufly increafed in bulk by the mere contact of thefe putrid fteams, where no faline fubftances could have accefs to them, we cannot help thinking this a decifive experiment concerning the manner in which the ground is fertilized by manuring with dung or other putrid fubftances.

21 Effects of faline fubftances on growing vegetables.

We fhall conclude this part of the fubject with an account of fome experiments concerning the effects of faline fubftances on the growth of vegetables. The following are related by Lord Kames, in his Gentleman Farmer.—"A number of Jerufalem artichokes were fet in pots filled with pure fand. One plant was kept as a ftandard, being nourifhed with water only. Other plants of the fame kind were nourifhed with water in which falt of tartar, a fixed alkali, was diffolved. Thefe grew more vigoroufly than the ftandard plant; but, by reiterated waterings, there came to be fuch an accumulation of the fixed alkali among the fand, as to make the plants decay, and at laft to die. Some plants were nourifhed with water in which fal-ammoniac, a volatile alkali, was diffolved. Thefe grew alfo well for fome time; but, like the former, were deftroyed by frequent reiterations of it. Weak lime-water promoted the growth of its plants more than common water. But water completely faturated with quicklime, proved more noxious than that which contained a fixed alkali, though lefs than that which contained a folution of volatile alkali.—Urine promoted, for a long time, the growth of its plants; and *the moft putrid appeared to have the ftrongeft effect;* but at laft it totally deftroyed them. *Water impregnated with putrid animal and vegetable fubftances, did more effectually promote the growth of its plants than any other folution; and in every ftage of the procefs appeared to be falutary.*"

22 Common [...]ffectual as a manure.

With regard to other faline fubftances, there are not many experiments which can be depended upon concerning their qualities as a manure. Mr Anderfon relates an experiment made with common falt; the fuccefs of which, we apprehend, may juftly enough be taken as a fpecimen of what is to be expected from manures of a fimilar kind.—He marked out a circle of fix feet diameter in the middle of a grafs-field, which he diftinguifhed by driving a ftake in its centre. All over this circle he ftrewed common falt, which, about the ftake, lay near an inch thick on the ground. In this ftate he left it to the operations of nature. The grafs fprung up as ufual, neither better nor worfe about the ftake than in the reft of the field, and the place where the circle was could be diftinguifhed only by the ftake, which was left there for fome years.

Upon thefe experiments we need make very few obfervations. They are fo much in favour of our theory, that they feem made on purpofe to confirm it. The fixed

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fixed alkali employed in Lord Kames's experiments would firſt exert its ſolvent powers on ſuch heterogeneous ſubſtances as it met with among the ſand; for no ſand can be ſuppoſed to be perfectly free of theſe. As long as it exerted its ſtrength on theſe only, the plant would thrive, for the reaſons we have already mentioned; but having exhauſted the ſmall quantity of ſubſtances contained in the ſand, it would next attack the plant itſelf, which conſequently would decay and die. The ſame effects would neceſſarily follow in a greater degree from ſtrong lime-water which contains lime in its cauſtic ſtate; for this is a more powerful ſolvent than fixed alkali itſelf, and would not fail to deſtroy every thing it touched; nor is it at all improbable that the plant would ſeem to grow vigorouſly by the diſſolution of part of its own roots, more nouriſhment being by this means given to thoſe which remained ſound.—Volatile alkali is likewiſe a powerful ſolvent: but, by reaſon of its volatility, would exert its cauſtic power on the plant ſooner than either lime or fixed alkali; and accordingly it ſeems to have been the moſt deſtructive of any thing that was tried. It ſeems owing to this, that putrid urine at laſt deſtroyed the plants whoſe growth it ſo long promoted; while water impregnated with other putrid matters, which yield no volatile alkali without heat, proved always ſalutary.

23 End to be kept in view by a farmer.

From all this, we may draw the following general concluſion, viz. That the principal end which a farmer ought to keep in view, is to impregnate his ground as much as poſſible, with ſubſtances which either actually contain putrid matter, or which are in their own nature *ſeptic*, or promoters of putrefaction. To impregnate the air with putrid effluvia is impoſſible: and tho' it could be done, would be highly dangerous; for however ſalutary ſuch effluvia may be to vegetables, nothing can be more fatal to mankind. The putrid ſubſtances, therefore, can only be uſed by mixing them with the earth; and in whatever manner they can be moſt perfectly, and in the greateſt quantity, mixed with the ſoil, there the beſt crops may be expected.

Sect. III. *Of the different Soils, and the Manures moſt proper for each.*

24 Richeſt ſoils muſt at laſt be impoveriſhed.

According to the theory we have juſt now laid down, the richeſt ſoil muſt be that which contains the greateſt quantity of putrid matter, either animal or vegetable; and ſuch is the earth into which animal and vegetable ſubſtances reſolve themſelves. Was this earth to be had in perfection, it is evident it could not ſtand in need of manure of any kind, or be in the leaſt enriched by it; for containing an immenſe quantity of putrid matter, it would freely communicate it to the vegetables planted in it, which would grow in the moſt luxuriant manner, without requiring any other care than that of keeping them conſtantly ſupplied with water. If we ſuppoſe the crop left upon the ground to putrefy and mix with the earth as before, the ſoil will contain the ſame quantity of putrid matter the ſecond year that it did the firſt, and be equally prolific: but if the crop is removed to another place, and nothing is brought back to enrich the ground in its ſtead, it is evident, that it will contain leſs of the true vegetable food the ſecond year than it did the firſt, and conſequently be leſs prolific. For ſome time, however, the difference will not be perceptible; and people who are in poſſeſſion of ſuch ground may imagine that they enjoy a ſoil which will be perpetually fertile; but long experience has taught us, that the richeſt ſoils will at laſt be exhauſted by repeated cropping without manure, as according to our theory they ought to be.

Where the ground has been ſuffered to remain uncultivated for many ages, producing all that time ſucculent plants which are eaſily putrefied, and trees, the leaves of which likewiſe contribute to enrich the ground by their falling off and mixing with it, the ſoil will in a manner be totally made up of pure vegetable earth, and be the richeſt, when cultivated, that can be imagined. This was the caſe with the lands of America. They had remained uncultivated perhaps ſince the creation, and were endowed with an extraordinary degree of fertility; nevertheleſs we are aſſured by one who went to America in order to purchaſe lands there, that ſuch grounds as had been long cultivated, were ſo much exhauſted, as to be much worſe than the generality of cultivated grounds in this country. Here, then, we have an example of one ſpecies of poor ſoil; namely, one that has been formerly very rich, but has been deprived, by repeated cropping, of the greateſt part of the vegetable food it contained. The farmer who is in poſſeſſion of ſuch ground, would no doubt willingly reſtore it to its former ſtate; the preſent queſtion is, What muſt be done in order to obtain this end? We have mentioned ſeveral kinds of manures which long practice has recommended as ſerviceable for improving ground: we ſhall ſuppoſe the farmer tries lime, or chalk; for, as we have already ſeen, their operations upon the ſoil muſt be preciſely the ſame. This ſubſtance, being of a ſeptic nature, will act upon ſuch parts of the ſoil as are not putrefied, or but imperfectly ſo; in conſequence of which, the farmer will reap a better crop than formerly. The ſeptic nature of the lime is not altered by any length of time. In ploughing the ground, the lime is more and more perfectly mixed with it, and gradually exerts its power on every putreſcible matter it touches. As long as any matter of this kind remains, the farmer will reap good crops: but when the putreſcible matter is all exhauſted, the ground then becomes perfectly barren; and the cauſtic qualities of the lime are moſt unjuſtly blamed for *burning* the ground, and reducing it to a *caput mortuum;* while it is plain, the lime has only done its office, and made the ſoil yield all that it was capable of yielding.

25 One ſpecies of poor ſoil deſtroyed by lime.

26 A ſpecies of poor ſoil meliorated by lime.

When ground has been long uncultivated, producing all the time plants, not ſucculent, but ſuch as are very difficultly diſſolved, and in a manner incapable of putrefaction; there the ſoil will be exceſſively barren, and yield very ſcanty crops, tho' cultivated with the greateſt care. Of this kind are thoſe lands covered with heath, which are found to be the moſt barren of any, and the moſt difficultly brought to yield good crops. In this caſe lime will be as ſerviceable, as it was detrimental in the other: for by its ſeptic qualities, it will continually reduce more and more of the ſoil to a putrid ſtate; and thus there will be a conſtant ſucceſſion of better and better crops, by the continued uſe of lime when the quantity firſt laid on has exerted all its force. By a continued uſe of this manure, the ground will be gradually brought nearer and nearer to the nature of garden-mould; and, no doubt, by proper care, might be

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made as good as any: but it will be as great a miftake to imagine, that, by the ufe of lime, this kind of foil may be rendered perpetually fertile, as to think that the other was naturally fo; for though lime enriches this foil, it does fo, not by adding vegetable food to it, but by preparing what it already contains; and when all is properly prepared, it muft as certainly be exhaufted as in the other cafe.

27
Poor foils, how reftored.

Here, then, we have examples of two kinds of *poor* foils; one of which is totally deftroyed, the other greatly improved, by lime, and which therefore require very different manures; lime being more proper for the laft than dung; while dung, being more proper to reftore an exhaufted foil than lime, ought only to be ufed for the firft. Befides dunging land which has been exhaufted by long cropping, it is of great fervice to let it lie fallow for fome time; for to this it owed its original fertility; and what gave the fertility originally, cannot fail to reftore it in fome degree.

By attending to the diftinction between the reafons for the poverty of the two foils juft now mentioned, we will always be able to judge with certainty in what cafes lime is to be ufed, and when dung is proper. The mere poverty of a foil is not a criterion whereby we can judge; we muft confider what hath made it poor. If it is naturally fo, we may almoft infallibly conclude, that it will become better by being manured with lime. If it is *artificially* poor, or exhaufted by continual cropping, we may conclude that lime will entirely deftroy it.—We apprehend, that it is this *natural* kind of poverty only which Mr Anderfon fays, in his Effays on Agriculture, may be remedied by lime; for we can fcarce think that experience would direct any perfon to put lime upon land already exhaufted. His words are,

28
Mr Anderfon's opinion concerning lime.

"Calcareous matters act as powerfully upon land that is naturally poor, as upon land that is more richly impregnated with thofe fubftances that tend to produce a luxuriant vegetation."

"Writers on agriculture have long been in the cuftom of dividing manures into two claffes, viz. *Enriching* manures, or thofe that tended directly to render the foil more prolific, however fterile it may be; among the foremoft of which was dung: *Exciting* manures, or thofe that were fuppofed to have a tendency to render the foil more prolific, merely by acting upon thofe enriching manures that had been formerly in the foil, and giving them a new ftimulus, fo as to enable them to operate anew upon that foil which they had formerly fertilized. In which clafs of ftimulating manures, *lime* was always allowed to hold the foremoft place.

"In confequence of this theory, it would follow, that lime could only be of ufe as a manure when applied to rich foils—and when applied to poor foils, would produce hardly any, or even perhaps hurtful, effects.

"I will frankly acknowledge, that I myfelf was fo far impofed upon by the beauty of this theory, as to be hurried along with the general current of mankind, in the firm perfuafion of the truth of this obfervation, and for many years did not fufficiently advert to thofe facts that were daily occurring to contradict this theory.—I am now, however, firmly convinced, from repeated obfervations, that lime, and other calcareous manures, produce a much greater *proportional* improvement upon poor foils than fuch as are richer.—And that lime alone, upon a poor foil, will, in many cafes, produce a much greater and more lafting degree of fertility than dung alone."

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Thus far Mr Anderfon's experience is exactly conformable to the theory we have laid down, and what ought to happen according to our principles. He mentions, however, fome facts which feem very ftrongly to militate againft it; and indeed he himfelf feems to proceed upon a theory altogether different.

29
Query concerning the nature of a proper foil.

"Calcareous matter alone (fays he) is not capable of rearing plants to perfection;—mould is neceffary to be mixed with it in certain proportions, before it can form a proper foil. It remains, however, to be determined, what is the due proportion of thefe ingredients for forming a proper foil.

"We know that neither chalk, nor marle, nor lime, can be made to nourifh plants alone; and foils are fometimes found that abound with the two firft of thefe to a faulty degree. But the proportion of calcareous matter in thefe is fo much larger than could ever be produced by art, where the foil was naturally deftitute of thefe fubftances, that there feems to be no danger of erring on that fide. Probably it would be much eafier to correct the defects of thofe foils in which calcareous matters fuperabound, by driving earth upon them as a manure, than is generally imagined; as a very fmall proportion of it fometimes affords a very perfect foil. I fhall illuftrate my meaning by a few examples.

30
Examples of foil perpetually fertile.

"Near Sandfide, in the county of Caithnefs, there is a pretty extenfive plain on the fea-coaft, endowed with a moft fingular degree of fertility. In all feafons it produces a moft luxuriant herbage, although it never got any manure fince the creation; and has been for time immemorial fubjected to the following courfe of crops.

"1. Bear, after once ploughing from grafs, ufually a good crop.

"2. Bear, after once ploughing, a better crop than the firft.

"3. Bear, after once ploughing, a crop equal to the firft.

"4. 5. and 6. Natural grafs, as clofe and rich as could be imagined, might be cut, if the poffeffor fo inclined, and would yield an extraordinary crop of hay each year.

"After this the fame courfe of cropping is renewed. The foil that admits of this fingular mode of farming, appears to be a pure incoherant fand, deftitute of the fmalleft particle of vegetable mould; but, upon examination, it is found to confift almoft entirely of broken fhells: the fine mould here bears fuch a fmall proportion to the calcareous matter, as to be fcarce perceptible, and yet it forms the moft fertile foil that ever I yet met with.

"I have feen many other links (downs) upon the fea-fhore, which produced the moft luxuriant herbage, and the clofeft and fweeteft pile of grafs, where they confifted of fhelly fand; which, without doubt, derive their extraordinary fertility from that caufe.

"A very remarkable plain is found in the ifland of Jir-eye, one of the Hebrides. It has been long employed as a common; fo that it has never been difturbed by the plough, and affords annually the moft luxuriant crop of herbage, confifting of white clover, and other

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other valuable pafture-graffes, that can be met with any where. The foil confifts of a very pure fhelly fand.

"From thefe examples, I think it is evident, that a very fmall proportion of vegetable mould is fufficient to render calcareous matter a very rich foil. Perhaps, however, a larger proportion may be neceffary when it is mixed with clay than with fand; as poor chalky foils feem to be of the nature of that compofition.

To thefe examples brought by Mr Anderfon, we may add fome of the fame kind mentioned by Lord Kames. His lordfhip having endeavoured to eftablifh the theory of water being the only food of plants, tho' he himfelf frequently deviates from that theory, yet thinks it poffible, upon fuch a principle, to make a foil perpetually fertile.

"To recruit (fays he) with vegetable food, a foil impoverifhed by cropping, has hitherto been held the only object of agriculture. But here opens a grander object, worthy to employ our keeneft induftry, that of making a foil perpetually fertile. Such foils actually exift; and why fhould it be thought, that imitation here is above the reach of art? Many are the inftances of nature being imitated with fuccefs. Let us not defpair, while any hope remains; for invention never was exercifed upon a fubject of greater utility. The attempt may fuggeft proper experiments: it may open new views: and if we fail in equalling nature, may we not, however, hope to approach it? A foil perpetually fertile muft be endowed with a power to retain moifture fufficient for its plants; and at the fame time muft be of a nature that does not harden by moifture. Calcareous earth promifes to anfwer both ends: it prevents a foil from being hardened by water; and it may probably alfo invigorate its retentive quality. A field that got a fufficient dofe of clay-marle, carried above 30 fucceffive rich crops, without either dung or fallow. Doth not a foil fo meliorated draw near to one perpetually fertile? Near the eaft fide of Fife, the coaft for a mile inward is covered with fea-fand, a foot deep or fo; which is extremely fertile, by a mixture of fea-fhells reduced to powder by attrition. The powdered fhells, being the fame with fhell-marle, make the fand retentive of moifture; and yet no quantity of moifture will unite the fand into a folid body. A foil fo mixed, feems to be not far diftant from one perpetually fertile. Thefe, it is true, are but faint effays; but what will not perfeverance accomplifh in a good caufe?"

Having thus, in a manner, pofitively determined with Mr Anderfon, that no dofe of calcareous matter can poffibly be too great, we cannot help owning ourfelves furprifed on finding his Lordfhip expreffing himfelf as follows: "An over-dofe of fhell-marle, laid perhaps an inch, and an inch and a half, or two inches thick, produces, for a time, large crops; but at laft it renders the foil a *caput mortuum*, capable of neither corn nor grafs; of which there are too many inftances in Scotland; the fame probably would follow from an over-dofe of clay-marle, ftone-marle, or pounded limeftone."—To account for this, he is obliged to make a fuppofition directly contrary to his former one; namely, that calcareous matter renders the foil *incapable* of retaining water. This phenomenon, however, we think is folved upon the principles above laid down, in a fatisfactory manner, and without the leaft inconfiftency.

31 Inconfiftency in Lord Kames's theory.

As to rendering foils perpetually fertile, we cannot help thinking the attempt altogether chimerical and vain. There is not one example in nature of a foil perpetually fertile, where it has no fupply but from the air, and the rain which falls upon it. The above recited examples can by no means be admitted as proofs of perpetual fertility. We know, that the grafs on the banks of a river is much more luxuriant than what grows at a diftance: the reafon is, that the water is attracted by the earth, and communicates its fertilizing qualities to it; but was the river to be dried up, the grafs would foon become like the reft. Why fhould not the ocean have the fame power of fertilizing plains near its fhores, that rivers have of fertilizing fmall fpots near their banks? We fee, however, that it hath not; for the fea-fhores are generally fandy and barren. The reafon of this is, that the waters of the ocean contain a quantity of loofe acid*; and this acid is poifonous to plants; but abftracting this acid part, we hefitate not to affirm, that fea-water is more fertilizing than river-water. It is impoffible to know how far the waters of the ocean penetrate under ground through a fandy foil. Where they meet with nothing to abforb their acid, there the ground is quite barren; but in paffing through an immenfe quantity of broken fhells, the calcareous matter, we are very certain, will abforb all the acid; and thus the foil will be continually benefited by its vicinity to the ocean. All the above fields, therefore, are evidently fupplied with nourifhment from the ocean: for if the falt-water has fufficient efficacy to render fields which are in its neighbourhood barren, why fhould it not render them fertile when the caufe of barrennefs is removed from its waters?

32 Perpetual fertility of foils chimerical.

* See *Water*.

After all, the field in Caithnefs, mentioned by Mr Anderfon, feems to have been perpetually fertile only in grafs; for though the fecond year it carried a better crop of bear than it did the firft, yet the third year the crop was worfe than the fecond, and only equal to the firft. Had it been ploughed a fourth time, the crop would probably have been worfe than the firft. Ground is not near fo much exhaufted by grafs as corn, even though the crop be cut, and carried off; and ftill lefs, if it only feeds cattle, and is manured by their dung; which appears to have been the cafe with this field. Lord Kames, indeed, mentions fields in Scotland, that, paft memory, have carried fucceffive crops of wheat, peafe, barley, oats, without a fallow, and without a manure; and particularifes one on the river Carron, of nine or ten acres, which had carried 103 crops of oats without intermiffion, and without manure: but as we are not acquainted with any fuch fields, nor know any thing about their particular fituation, we can form no judgment concerning them.

33 Clay and fandy foils.

Befides the two kinds of foils above mentioned, there are others, the principal ingredient of which is clay or fand. The firft of thefe is apt to be hardened by the heat of the fun, fo that the vegetables can fcarce penetrate it in fuch a manner as to receive proper nourifhment. The fecond, if it is not fituated fo as to receive a great deal of moifture, is very apt to be parched up in fummer, and the crop deftroyed; nor has it fufficient adhefion to fupport plants that have few roots and grow high. From thefe oppofite qualities, it is evident, that thefe two foils would be a proper manure for one another; the clay would give a fufficient degree of firmnefs to the fand, and the fand would break the

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the too great tenacity of the clay. According to Dr Home's experiments, however, fand is the worft manure for clay that can be ufed. He recommends marle moft. To reduce clay-ground as near as poffible to the form of pure vegetable mould, it muft firft be pulverized. This is moft effectually performed by ploughing and harrowing; but care muft be taken not to plough it whilft too wet, otherwife it will concrete into hard clots which can fcarcely be broken. After it is pulverized, however, fome means muft be taken to keep it from concreting again into the fame hard maffes as before. According to Lord Kames, though clay, after pulverization, will concrete into as hard a mafs as before, if mixed with water; yet if mixed with dunghill juice, it will not concrete any more. Lime alfo breaks its tenacity, and is very ufeful as a manure for this kind of foil.

34 Fertility of the earth limited.

The conclufion we wifh the practical farmer to draw from our theory is, That there is a certain limit to the fertility of the earth, both as to duration and to degree, at any particular time: that the nearer any foil approaches to the nature of pure garden-mould, the nearer it is to the moft perfect degree of fertility; but that there are no hopes of keeping it perpetually in fuch a ftate, or in any degree of approximation to it, but by conftant and regular manuring with dung. Lime, chalk, marle, &c. may be proper to bring it near to this ftate, but are abfolutely unfit to keep it continually fo. They may indeed for feveral years produce large crops; but the more they increafe the fertility for fome years, the fooner will they bring on an abfolute barrennefs; while regular manuring with plenty of dung will always enfure the keeping up the foil in good condition, without any occafion for fallow. What we have faid concerning the ufe of lime, &c. applies likewife to the practice of frequent ploughing, though in a lefs degree. This tends to meliorate ground that is naturally poor, by giving an opportunity to the vegetable parts to putrefy; but when that is done, it tends to exhauft, though not fo much as lime. A judicious farmer will conftantly ftrive to keep his lands always in good condition, rather than to make them fuddenly much better; left a few years fhould convince him that he was in reality doing almoft irreparable mifchief, while he fancied himfelf making improvements. As for the ridiculous notions of ftimulating the ground by faline manures, we hope they will never enter the brain of any rational practitioner of agriculture.

Sect. IV. *Of the different kinds of Vegetables proper to be raifed with a view to the Melioration of Soil.*

35 Soil pulverized by certain vegetables.

The methods of meliorating foils, which we have mentioned above, confifting of tedious and laborious operations that yield no return at firft, it is natural for a farmer to wifh for fome method of meliorating his ground, and reaping crops at the fame time. One very confiderable ftep towards the melioration of ground is, its pulverization. This is accomplifhed by repeated ploughings (A), as already mentioned; efpecially if performed in autumn, that the ground may be expofed to the winter's froft; but thefe ploughings yield no crop as long as the field is not fown. By planting in the field, however, thofe vegetables whofe roots fwell to a confiderable bulk, the ground muft conftantly be acted upon by the fwelling of their roots in all directions; and thus the growing of the crop itfelf may be equal, or fuperior, in efficacy to feveral ploughings, at the fame time that the farmer enjoys the benefit of it. The plant moft remarkable for the fwelling of its roots is the potato; and by none is the ground meliorated more, or even fo much. They are not, however, equally proper for all foils. In clay they do not thrive, nor are palatable; but in hard gravelly or fandy foils, they grow to a large fize, and are of an excellent quality. Turnips likewife contribute to meliorate the ground, by the fwelling of their roots, though not fo much as potatoes. They have this advantage, however, that they will thrive in almoft any foil. In clay ground, peafe and beans thrive exceedingly well, and therefore are proper in this kind of foil as a preparatory for other kinds of grain. Thefe pufh their roots deep into the ground, and cover it with their leaves more than other crops; fo that the fun has not fo much accefs as when it is covered with other kinds of grain. Wherever any of thefe kinds of vegetables are raifed, it is obfervable, that more or lefs blacknefs is communicated to the foil: an evident fign of its melioration; this being the colour of the true vegetable mould, or *loamy foil*, as it is called.

Befides the above-mentioned plants, carrots, parfnips, cabbages, and all thofe vegetables which fink their roots deep in the ground, anfwer the fame purpofe of loofening and pulverifing the earth; but as they will not thrive but on ground already well cultivated, they cannot be raifed to any advantage for the purpofe of meliorating a poor foil.

It hath been cuftomary in many places, particularly in England, to fow turnip, peafe, buck-wheat, &c. and then to plough them down for manuring the land. This being fimilar to that operation of nature by which fhe renders the uncultivated foils fo exceedingly fertile, cannot fail of being attended with fingular advantages; and might be looked upon as preferable even to driving dung on the land to fatten it, was it not attended with the entire lofs of a crop for that year.

Sect. V. *Of deftroying Weeds.*

What we have already faid regarding the cultivation of the foil, refpects only the fitting it for producing all kinds of vegetables indifcriminately. Experience, however, fhows, that the ground is naturally much more difpofed to produce and nourifh fome kinds of vegetables than others; and thofe which the earth feems moft to delight in, are commonly fuch as are of very little ufe to man; but if neglected, will increafe to fuch a degree, as entirely to deftroy the plants intended to be raifed, or at leaft hinder them from coming to perfection, by depriving them of nourifhment. The clearing the ground of weeds, therefore, is an article no lefs neceffary in agriculture, than the difpofing it to produce vegetables of any kind in plenty.

(A) This, however, muft be underftood with fome limitation: for it appears from experience, that many *light* and *thin* foils receive detriment rather than advantage from frequent ploughings; particularly in fummer, when the fun exhales the nutritive particles in great abundance.

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36 Weeds divided into annual and perennial.

The weeds may be divided, according to the time of their duration, into *annual*, or ſuch as ſpring from a ſeed, and die the ſame year; and *perennial*, that is, ſuch as are propagated by the roots, and laſt for a number of years. The firſt kind are the leaſt noxious, and moſt eaſily deſtroyed. For this purpoſe it will be ſufficient to let them ſpring up till near the time of ripening their ſeed, and then plough them down before it comes to maturity. It is alſo of ſervice to deſtroy ſuch weeds as grow in borders, or neglected corners, and frequently ſcatter their ſeeds to a great diſtance; ſuch as the thiſtle, dandelion, rag-weed, &c. for theſe are ſufficient to propagate their ſpecies through a deal of ground; as their ſeeds are carried about with the wind to very conſiderable diſtances. A farmer ought alſo to take care, that the ſmall ſeeds of weeds, ſeparated from corn in winnowing, be not ſown again upon the ground; for this certainly happens when they are thrown upon a dunghill; becauſe, being the natural offspring of the earth, they are not eaſily deſtroyed. The beſt method of preventing any miſchief from this cauſe, would be to burn them.

37 Perennial weeds, how deſtroyed.

Perennial weeds cannot be effectually deſtroyed, but by removing the roots from the ground, which is often a matter of ſome difficulty. Many of theſe roots ſtrike ſo deep in the ground, that they can ſcarcely be got out. The only method that can be depended upon in this caſe, is frequent ploughing, to render the ground as tender as poſſible; and harrowing with a particular kind of harrow, which ſhall hereafter be deſcribed, in order to collect theſe pernicious roots. When collected, they ought to be dried and burnt, as the only effectual method of inſuring their doing no further miſchief.

There is a particular ſpecies of weed, peculiar only to graſs-lands, of a ſoft ſpongy nature, called *fog*, which it is found very difficult to exterminate. Where the land can be conveniently tilled, this weed may be deſtroyed by covering it with a crop of peaſe, potatoes, &c. or, paſſing a heavy roller over the gound will be of great ſervice; for fog owes its origin to too great a laxity of the ſoil, and will not grow upon firm ground.

38 Broom, furze, &c. how deſtroyed.

Beſides theſe kinds of weeds which are of an herbaceous nature, there are others which are woody, and grow to a very conſiderable ſize; ſuch as broom, furze or whins, and thorns. *Broom* is an evergreen ſhrub, that thrives beſt in ſandy ſoil; and there it grows ſo vigorouſly, as ſcarce to admit any graſs under it. It propagates by ſeed which grows in pods; and theſe, when fully ripe, break with violence, ſcattering the ſeeds all around. Thus, a field which is overgrown with broom, beſides the old plants, always contains an infinite number of young ones; ſo that though the old plants die when cut over, a freſh crop conſtantly ſprings up. It may, however, be deſtroyed by frequent ploughing and harrowing, in the ſame manner as other perennial weeds are; for it does not for ſome time carry any ſeed, and the frequent ploughing encourages the vegetation of all thoſe that are already in the ground, which cannot fail of being deſtroyed by frequent repetitions of the operation. Another method of deſtroying broom, is by paſturing the field where it grows with ſheep. A few of the old buſhes may be left as a ſhelter, and theſe will be in a good meaſure prevented from ſpreading by the cropping of the ſheep. Theſe animals are very fond of broom, and greedily devour every young ſhoot; ſo that if any remain after the firſt year, there will not be a veſtige the ſecond. If this method of extirpating broom is equally effectual with that of frequent ploughing, it is certainly much more profitable, as there is no food more nouriſhing to ſheep than young broom. Broom, however, is ſaid to have a ſingular effect upon ſheep: it makes them drunk ſo effectually, that when heated with a little driving, they tumble over, and lie without motion.

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The *whin* is a fine evergreen ſhrub, carrying a ſweet-ſmelling flower all the year round. It propagates both by ſeed and by its roots, which ſpread ſometimes to the diſtance of 10 or 12 feet; and hence, when once eſtabliſhed, it is with difficulty extirpated. The beſt method is to ſet fire to the whins in froſty weather; for froſt has the effect to wither whins, and make them burn readily. The ſtumps muſt then be cut over with a hatchet; and when the ground is well ſoftened by rain, it may be ploughed up, and the roots taken out by a harrow adapted to that purpoſe. If the field is ſoon laid down to graſs, the whins will again ſpring up in great abundance, from the ſeeds, and ſmall parts of the roots left in the ground. In this caſe, paſturing with ſheep is an effectual remedy; as they are no leſs fond of young whins than of young broom; and if there are a ſufficient number, they will not leave a ſingle plant above ground. But if graſs is not immediately wanted, the moſt effectual method of clearing a field of whins, is by reiterated ploughings.

The *thorn*, or *bramble*, ſpreads its roots very wide, and at the ſame time ſinks them deep in the earth. Though cut in the winter, it riſes, and comes to ſuch perfection as to carry fruit in ſummer. It can only be extirpated by ploughing up the ground, and collecting the roots.

SECT. VI. *Of the moſt proper kinds of Vegetables to be raiſed for the purpoſes of feeding Cattle.*

THOUGH this muſt be an article of the utmoſt conſequence to every farmer, we do not find that it has been much conſidered. Mr Anderſon ſeems to have been the firſt writer on agriculture who hath properly attended to this ſubject; and what he hath wrote upon it, is rather a catalogue of deſiderata, than any thing elſe: and indeed the deſiderata on this ſubject are ſo many and ſo great, that we muſt acknowledge ourſelves very unable to fill them up.——To attain to a competent knowledge in this reſpect, the following things muſt be taken into conſideration. (1.) The wholeſomeneſs of the food for cattle, with regard to health and ſtrength, or fatneſs. (2.) The quantity that any extent of ground is capable of yielding. (3.) The quantity neceſſary to feed the different kinds of cattle. (4.) The labour of cultivation; and, (5.) The ſoil they require to bring them to perfection, and the effect they have upon it.

39 Qualities of the food requiſite for cattle.

With regard to the wholeſomeneſs, it is plain, that as the natural food of wild cattle is the green ſucculent plants they meet with all the year round, food of this kind, could it be had, muſt be preferable to hay; and accordingly we find that cattle will always prefer ſucculent vegetables where they can get them. To find plants

plants of this kind, and having proper qualities in other reſpects, we muſt ſearch among thoſe which continue green all the year round, or come to their greateſt perfection in the winter-time.—Of theſe, cabbages bid fair for holding the firſt place; both as being very ſucculent, and a very large quantity of them growing upon a ſmall ſpace of ground. In Mr Young's Six Months Tour, we have an account of the produce of cabbages in many different places, and on a variety of ſoils. The produce by Mr Crow at Keplin, on a clay ſoil, was, on an average of ſix years, 35 tons per acre; by Mr Smelt at the Leaſes, on a ſandy gravel, 18 tons per acre; by Mr Scroop at Danby, on an average of ſix years, 37 tons per acre: and the general average of all the accounts given by Mr Young, is 36 tons per acre.

40 Cabbages, their properties.

Cabbages, however, have the great inconveniency of ſometimes imparting a diſagreeable flavour to the milk of cows fed with them, and even to the fleſh of other cattle. This, it is ſaid, may be prevented by carefully picking off the decayed and withered leaves: and very probably this is the caſe; for no vegetable inclines more to putrefaction than this; and therefore particular care ought to be taken to pull off all the leaves that have any ſymptoms of decay. Dr Prieſtley found that air was rendered noxious by a cabbage-leaf remaining in it for one night, though the leaf did not ſhow any ſymptom of putrefaction.—For milk-cows, probably the cabbages might be rendered more proper food by boiling them.

41 Air rendered noxious by them.

42 Turnip-rooted cabbage.

The culture of the turnip-rooted cabbage has lately been much practiſed, and greatly recommended, particularly for the purpoſe of a late ſpring feed; and ſeems indeed to be a moſt important article in the farming œconomy, as will be ſhown in its proper place.

43 Turnips.

Turnips likewiſe produce very bulky crops, though far inferior to thoſe of cabbages. According to Mr Young's calculation, the fineſt ſoil does not produce above five tons of turnips per acre; which is indeed a very great diſproportion: but poſſibly ſuch a quantity of turnips may not be conſumed by cattle as of cabbages; an ox, of 80 ſtone weight, eat 210 lb. of cabbages in 24 hours, beſides ſeven pound of hay.

44 Carrots.

Carrots are found to be an excellent food for cattle of all kinds, and are greatly reliſhed by them. In a rich ſand, according to Mr Young's account, the produce of this root was 200 buſhels per acre. In a finer ſoil, it was 640 buſhels per acre. A lean hog was fatted by carrots in ten days time: he eat 196 lb.; and his fat was very fine, white, firm, and did not boil away in the dreſſing. They were preferred to turnips by the cattle; which having taſted the carrots, ſoon became ſo fond of them, as difficultly to be made to eat the turnips at all. It is probable, indeed, that carrots will make a more wholeſome food for cattle than either cabbages or turnips, as they are ſtrongly antiſeptic; inſomuch as to be uſed in poultices for correcting the ſanies of cancers. It is probably owing to this, that the milk of cows fed on carrots is never found to have any bad taſte. Six horſes kept on them thro' the winter without oats, performed their work as uſual, and looked equally well. This may be looked upon as a proof of their ſalubrity as a food; and it certainly can be no detriment to a farmer to be ſo much verſant in medical matters, as to know the impropriety of giving putreſcent food to his cattle. It is well known, what a prodigious difference there is in the health of the human ſpecies when fed on putrid meats, in compariſon of what they enjoy when ſupplied with food of a contrary nature; and why may there not be a difference in the health of beaſts, as well as of men, when in ſimilar circumſtances?—It is alſo very probable, that as carrots are more ſolid than cabbages or turnips, they will go much farther in feeding cattle than either of them. The above-mentioned example of the hog ſeems ſome kind of confirmation of this; he being fed, for ten days together, with 21 lb. leſs weight of carrots than what an ox devoured of cabbages and hay in one day. There is a great diſproportion, it muſt be owned, between the bulk of an ox and that of a hog; but we can ſcarce think that an ox will eat as much at a time as ten hogs. At Parlington in Yorkſhire, 20 work-horſes, four bullocks, and ſix milk-cows, were fed on the carrots that grew on three acres, from the end of September till the beginning of May; and the animals never taſted any other food but a little hay. The milk was excellent, and 30 hogs were fattened upon what was left by the other cattle.

45 Potatoes.

Potatoes likewiſe appear to be a very palatable food for all kinds of cattle; and not only oxen, hogs, &c. are eaſily fed by them, but even poultry. The cheapneſs of potatoes compared with other kinds of food for cattle, cannot well be known, as, beſides the advantage of the crop, they improve the ground more than any other known vegetable. According to a correſpondent of the Bath Society *, "roaſting pork is never ſo moiſt and delicate as when fed with potatoes, and killed from the barn-doors without any confinement. For bacon and hams, two buſhels of pea-meal ſhould be well incorporated with four buſhels of boiled potatoes, which quantity will fat a hog of twelve ſtone (fourteen pounds to the ſtone). Cows are particularly fond of them: half a buſhel at night, and the ſame proportion in the morning, with a ſmall quantity of hay, is ſufficient to keep three cows in full milk; they will yield as much and as ſweet butter as the beſt graſs. In fattening cattle, I allow them all they will eat: a beaſt of about 35 ſtone will require a buſhel per day, but will fatten one-third ſooner than on turnips. The potatoes ſhould be clean waſhed, and not given until they are dry. They do not require boiling for any purpoſe but fattening hogs for bacon, or poultry; the latter eat them greedily. I prefer the champion potato to any ſort I ever cultivated. They do not anſwer ſo well for horſes and colts as I expected (at leaſt they have not with me), though ſome other gentlemen have approved of them as ſubſtitutes for oats."

* *Letters and Papers on Agriculture*, &c. vol. iii. art. 16.

The above-mentioned vegetables have all of them the property of meliorating, rather than exhauſting the ſoil; and this is certainly a very valuable qualification: but carrots and cabbages will not thrive except in ſoils that are already well cultivated; while potatoes and turnips may be uſed as the firſt crops of a ſoil with great advantage. In this reſpect, they are greatly ſuperior to the others; as it may be diſagreeable to take up the beſt grounds of a farm with plants deſigned only for food to cattle.

46 Buck-wheat.

Buck-wheat (*Polygonum fagopyrum*) has been lately recommended as an uſeful article in the preſent as well as other reſpects. It has been chiefly applied to the

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feeding of hogs, and efteemed equal in value to barley; it is much more eafily ground than barley, as a malt-mill will ground it completely. Horfes are very fond of the grain; poultry of all forts are fpeedily fattened by it; and the bloffom of the plant affords food for bees at a very opportune feafon of the year, when the meadows and trees are moftly ftripped of their flowers. Probably the grain may hereafter be even found a material article in diftillation, fhould a fufficient quantity be raifed with that view. From the fuccefs of fome experiments detailed in the Bath Society Papers, and for which a premium was beftowed, it has been inferred, that this article ought in numerous cafes to fuperfede the practice of fummer-fallowing.

47 Whins an excellent food for horfes.

Whins have lately been recommended as a very proper food for cattle, efpecially horfes; and are recommended by Mr Anderfon in a particular manner. They have this advantage, that they require no culture, and grow on the very worft foil; but they are troublefome to cut, and require to be bruifed in a mill conftructed for this purpofe; neither is the ground at all meliorated by letting whins grow upon it for any length of time. Notwithftanding thefe difadvantages, however, as whins continue green all the year round, and when bruifed will afford an excellent fucculent food, which feems poffeffed of ftrongly invigorating qualities, they may be looked upon as the cheapeft winter-food that can poffibly be given to cattle.—According to the calculations of Mr Eddifon of Gateford, a fingle acre, well cropped with whins, will winter fix horfes: at three or four years growth, the whole crop fhould be taken, cut clofe to the ground, and carried to the mill; in which the whins are to be bruifed, and then given to the horfes. Four acres ought to be planted, that one may be ufed each year, at the proper age to be cut; and he reckons the labour of one man fufficient for providing food to this number of horfes. He fays they all prefer the whins to hay, or even to corn.

48 Burnet.

The herb called *burnet* hath likewife been recommended as proper food for cattle, on account of its being an evergreen; and further recommended, by growing almoft as faft in winter as in fummer. Of this herb, however, we have very various accounts. In a letter addreffed by Sir James Caldwell, F. R. S. to the Dublin Society, the culture of this plant is ftrongly recommended on the authority of one Bartholomew Rocque, farmer at Walham-Green, a village about three miles fouth-weft of London.

49 Recommended by Sir James Caldwell.

What gave occafion to the recommendation of this plant, was, that about the year 1760, Mr Wych, chairman of the committee of Agriculture of the London Society for the encouragement of arts, manufactures, and commerce, came to Rocque (who was become very eminent by the premiums he had received from the fociety), and told him, he had been thinking, that as there are many animals which fubfift wholly upon the fruits of the earth, there muft certainly be fome plant or herb fit for them that naturally vegetates in winter; otherwife we muft believe the Creator, infinitely wife and good, to have made creatures without providing for their fubfiftence; and that if there had been no fuch plants or herbs, many fpecies of animals would have perifhed before we took them out of the hands of nature, and provided for them dry meat at a feafon, when, indigenous plants having been indifcriminately excluded, under the name of weeds, from cultivated fields and places fet apart for natural grafs, green or frefh meat was no longer to be found.

Rocque allowed the force of this reafoning; but faid, the knowledge of a grafs, or artificial pafture, that would vegetate in winter, and produce green fodder for cattle, was loft; at leaft, that he knew of no fuch plant.—Mr Wych, however, knowing how very great the advantage would be of difcovering a green fodder for winter and early in the fpring, wrote to Bern, and alfo to fome confiderable places in Sweden, ftating the fame argument, and afking the fame queftion. His anfwers to thefe letters were the fame that had been given by Rocque. They owned there muft be fuch plant, but declared they did not know it.

Mr Wych then applied again to Rocque; and defired him to fearch for the plant fo much defired, and fo certainly exifting. Rocque fet about this fearch with great affiduity; and finding that a pimpernel, called *burnet*, was of very fpeedy growth, and grew near as faft in winter as in fummer, he took a handful of it and carried it into his ftable, where there were five horfes; every one of which eat of it with the greateft eagernefs, fnatching it even without firft fmelling it. Upon the fuccefs of this experiment he went to London, and bought all the burnet-feed he could get, amounting to no more than eight pounds, it having been only ufed in falads; and he paid for it at the rate of 4 s. a pound. Six of the eight pounds of feed he fowed upon half an acre of ground, in March, in the year 1761, with a quarter of a peck of fpring-wheat, both by hand. The feed being very bad, it came up but thin. However, he fowed the other two pounds in the beginning of June, upon about fix rood of ground: this he mowed in the beginning of Auguft; and at Michaelmas he planted off the plants on about 20 rood of ground, giving each plant a foot every way, and taking care not to bury the heart. Thefe plants bore two crops of feed the year following; the firft about the middle of June, the fecond about the middle of September; but the June crop was the beft. The year after, it grew very rank, and produced two crops of feed, both very good. As it ought not to be cut after September, he let it ftand till the next year; when it fheltered itfelf, and grew very well during all the winter, except when there was a hard froft; and even during the froft it continued green, though it was not perceived to grow. In the March following it covered the ground very well, and was fit to receive cattle.

If the winter is not remarkably fevere, the burnet, though cut in September, will be 18 inches long in March; and it may be fed from the beginning of February till May: if the cattle are taken off in May, there will be a good crop of feed in the beginning of July. Five weeks after the cattle are taken off, it may be removed, if that is preferred to its ftanding for feed; it grows at the rate of an inch a-day, and is made into hay like other grafs. It may be mown three times in one fummer, and fhould be cut juft before it begins to flower. Six rood of ground has produced 1150 pounds at the firft cutting of the third year after it was fowed; and, in autumn 1763, Rocque fold no lefs than 300 bufhels of the feed.

According to Rocque, the foil in which burnet flourifhes beft, is a dry gravel; the longeft drought never hurts

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hurts it: and Sir James Caldwell aſſerts, that he ſaw a very vigorous and exuberant plant of this kind, growing from between two bricks in a wall in Rocque's ground, without any communication with the ſoil; for he had cut away all the fibres of the root that had ſtretched downward, and penetrated the earth, long before.

Burnet was found equally fit for feeding cows, ſheep, and horſes; but the ſheep muſt not be ſuffered to crop it too cloſe. Though no ſeed was left among the hay, yet it proved nouriſhing food; and Rocque kept a horſe upon nothing elſe, who, at the time of writing the account, was in good heart, and looked well. He affirmed alſo, that it cured horſes of the diſtemper called the *greaſe*, and that by its means he cured one which was thought incurable; but ſays, it is only the firſt crop which has this effect.

50 Burnet reckoned an improper food by Mr Miller and Mr Anderſon.

This is the ſubſtance of Sir James Caldwell's letter to the Dublin Society, at leaſt as to what regards the culture of burnet; and it might reaſonably be expected, that a plant, whoſe uſe was recommended to the public with ſo much parade, would ſoon have come into univerſal eſteem. We were ſurpriſed, therefore, on looking into Mr Miller's Dictionary, to find the following words, under the article *Poterium*:—"This plant has of late been recommended by *perſons of little ſkill*, to be ſown as a winter pabulum for cattle: but whoever will give themſelves the trouble to examine the grounds where it naturally grows, will find the plants left uneaten by the cattle, when the graſs about them has been cropped to the roots; beſides, in wet winters, and in ſtrong land, the plants are of ſhort duration, and therefore very unfit for that purpoſe: nor is the produce ſufficient to tempt any perſon of ſkill to engage in its culture; therefore I wiſh thoſe perſons to make trial of it in ſmall quantities, before they embark largely in theſe new ſchemes."—Mr Anderſon, too, in his Eſſays on Agriculture, mentions the produce of burnet being ſo ſmall, as not to be worth cultivating.

51 White beet recommended.

Upon the authority of Mr Rocque, likewiſe, the white beet is recommended as a moſt excellent food for cows; that it vegetates during the whole winter, conſequently is very forward in the ſpring; and that the moſt profitable way of feeding cows is, to mow this herb, and give it to them green all the ſummer. It grew in Rocque's garden, during a very great drought, no leſs than four feet high, from the 30th of May to the 3d of July; which is no more than one month and four days. In ſummer it grows more than an inch a-day, and is beſt ſown in March: a buſhel is enough for an acre, and will not coſt more than ten ſhillings. It thrives beſt in a rich, deep, light ſoil: the ſtalks are very thick and ſucculent; the cows ſhould therefore eat them green.

52 Root of Scarcity.

Another ſpecies of beet (*Beta cicla*), the Mangel Wurzel, or *Root of Scarcity*, as it has been called, has been lately extolled as food both for man and cattle; but, after all, ſeems only to deſerve attention in the latter view. It is a biennial plant; the root is large and fleſhy, ſometimes a foot in diameter. It riſes above the ground ſeveral inches, is thickeſt at the top, tapering gradually downward. The roots are of various colours, white, yellow, and red; but theſe laſt are always of a much paler colour than beetrave. It is good fodder for cows, and does not communicate any taſte to the milk. It produces great abundance of leaves in ſummer, which may be cut three or four times without injuring the plant. The leaves are more palatable to cattle than moſt other garden plants, and are found to be very wholeſome. The farmers in thoſe parts of Germany where it is chiefly cultivated, we are told, prefer this ſpecies of beet, for feeding cattle, to cabbages, principally becauſe they are not ſo liable to be hurt by worms or inſects; but they think they are not ſo nouriſhing as turnips, potatoes, or carrots, and that cattle are not nearly ſo ſoon fattened by this root as by carrots, parſnips, or cabbages. It has even been aſſerted, that this root affords leſs nouriſhment than any of thoſe that have been commonly employed for feeding cattle. This does not correſpond with the pompous accounts with which the public has been entertained. Upon the whole, however, it is a plant which ſeems to deſerve the attention of our farmers; as on ſome ſoils, and in particular circumſtances, it may prove a very uſeful article for the above purpoſes.

In Mr Anderſon's eſſays, we find it recommended to make trial of ſome kinds of graſſes, which probably would not only anſwer for freſh fodder during the winter, but might alſo be cut for hay in ſummer. This is particularly the caſe with that ſpecies called *ſheep's feſcue graſs*. "I had (ſays he) a ſmall patch of this graſs in winter 1773; which, having been cut in the month of Auguſt or September preceding, was ſaved from that period, and had advanced before winter to the length of five or ſix inches; forming the cloſeſt pile that could be imagined. And although we had about ſix weeks of very intenſe froſt, with ſnow; and about other ſix weeks, immediately ſucceeding that, of exceeding keen froſt every night, with frequent thaws in the day-time, without any ſnow, during which time almoſt every green thing was deſtroyed; yet this little patch continued all along to retain as fine a verdure as any meadow in the month of May; hardly a point of a leaf having been withered by the uncommon ſeverity of the weather. And as this graſs begins to vegetate very early in the ſpring, I leave the reader to judge what might be the value of a field of graſs of this kind in theſe circumſtances."

53 Sheep's feſcue-graſs.

Of another kind of graſs, called *purple feſcue*, Mr Anderſon gives the following character. "It retained its verdure much better than rye-graſs during the winter-ſeaſon; but it had more of its points killed by the weather than the former. It likewiſe riſes in the ſpring, at leaſt as early as rye-graſs."

54 Purple feſcue.

This ingenious farmer has alſo made experiments on the culture of theſe and ſeveral other kinds of graſſes; which being very well worthy of attention, we ſhall here inſert.

1. *Purple feſcue-graſs*. "Although this graſs is very often found in old paſtures, yet as it has but few flower-ſtalks, and as it is greedily eat by all domeſtic animals, theſe are ſeldom ſuffered to appear; ſo that it uſually remains there unperceived. But it ſeems to be better able to endure the peculiar acrimony of the dung of dogs than almoſt any other plant; and is therefore often to be met with in *dog-hills*, as I call the little hills by road-ſides where dogs uſually piſs and dung: and as it is allowed to grow there undiſturbed, the farmer may have an opportunity of examining the plant, and becoming acquainted with its appearance.

"The leaves are long and ſmall, and appear to be roundiſh,

roundiſh, ſomething like a wire; but, upon examination, they are found not to be tubulated like a reed or ruſh; the ſides of the leaf being only folded together from the middle rib, exactly like the ſtrong bent-graſs on the ſea-ſhore. The flower-ſtalk is ſmall, and branches out in the head, a little reſembling the wild-oat; only the grains are much ſmaller, and the ear does not ſpread full open, but lies bending a little to one ſide. The ſtalks are often ſpotted with reddiſh freckles, and the tops of the roots are uſually tinged with the ſame colour; from whence it has probably obtained its diſtinctive name of *Feſtuca rubra*, or *red (purple) feſcue*.

"It is often to be met with in old garden-walks; and, as its leaves advance very quickly after cutting, it may uſually be diſcovered above the other graſſes, about a week or fortnight after the walks are cut. Nor do they ſeem to advance only at one ſeaſon, and then ſtop and decay, like the rye-graſs; but continue to advance during the whole of the ſummer, even where they are not cut; ſo that they ſometimes attain a very great length. Laſt ſeaſon, (1774,) I meaſured a leaf of this graſs, that ſprung up in a neglected corner, which was four feet and four inches in length, although not thicker than a ſmall wire. It is unneceſſary to add, that theſe leaves naturally trail upon the ground, unleſs where they meet with ſome accidental ſupport; and that if any quantity of it is ſuffered to grow for a whole ſeaſon, without being eat down or cut, the roots of the leaves are almoſt rotted, by the overſhadowing of the tops of the other leaves, before the end of the ſeaſon.

55 Appearance in its cultivated ſtate.

"This is the appearance and condition of the plant in its native ſituation: as it is ſeldom that it is diſcovered but in pretty old paſtures, and as in that ſtate it carries only a very few ſeed-ſtalks, it was with ſome difficulty that I could collect a ſmall handful of the ſeed, which I carefully ſowed in a ſmall patch of garden-mould, to try if it could be eaſily cultivated. It came up as quickly as any other kind of graſs, but was at firſt as ſmall as hairs: the leaves, however, advanced apace; and were, before autumn, when the grain with which they had been ſowed was cut down, about 16 or 18 inches in length: but having been ſown very thin, it was neceſſary to pick out ſome other kinds of graſs that came up amongſt it, leſt it might have been choaked by them. Early next ſpring it advanced with prodigious vigour, and the tufts that were formed from every ſeed became exceeding large; ſo that it quickly filled the whole ground. But now the leaves were almoſt as broad as thoſe of common rye-graſs, and the two ſides only inclined a little towards one another from the mid-rib, without any appearance of roundneſs. In due time a great many ſeed-ſtalks ſprung out, which attained very nearly to the height of four feet, and produced ſeeds in abundance; which may be as eaſily ſaved as thoſe of common rye-graſs.

"The prodigious difference between this plant in its native and cultivated ſtate amazed me; but it was with a good deal of ſatisfaction that I found there would be no difficulty of procuring ſeeds from it, which I had much doubted of at firſt. It would ſeem, that nature hath endowed this plant with a ſtrong generative power during its youth, which it gradually loſes as it advances in age (for the difference perceived in this caſe could not be attributed to the richneſs of the ſoil); and that, on the contrary, when it was old, the leaves advanced with an additional vigour, in proportion to the declining ſtrength of the flower-ſtalks: for the leaves of the young plant ſeldom exceed two feet, whereas numbers of the old leaves were near four feet in length.

"From theſe peculiarities in the growth of this plant, it would ſeem to promiſe to be of great uſe to the farmer; as he could reap from a field of it, for the firſt two or three years, as great a weight of hay as he could obtain from any of the culmiferous graſſes (thoſe bearing a long jointed ſtalk); and, if he meant afterwards to paſture it, he would ſuffer no inconveniences from the flower-ſtalks; and the ſucculent leaves that continue to vegetate during the whole ſummer, would at all times furniſh his cattle with abundance of wholeſome food. It has alſo been remarked, that this graſs riſes as early in the ſpring as rye graſs; and continues green for the greateſt part of winter, which the other does not. It is moreover an abiding plant, as it ſeems never to wear out of the ground where it has once been eſtabliſhed. On all which accounts, it appears to me highly to merit the attention of the farmer; and well deſerves to have its ſeveral qualities, and the culture that beſt agrees with it, aſcertained by accurate experiments.

56 Sheeps feſcue deſcribed.

2. "*Sheeps feſcue graſs*, or *feſtuca ovina*, is much praiſed by the Swediſh naturaliſts for its ſingular value as a paſture-graſs for ſheep; this animal being repreſented as fonder of it than of any other graſs, and fattening upon it more quickly than on any other kind of food whatever. And indeed, the general appearance of the plant, and its peculiar manner of growth, ſeems very much to favour the accounts that have been given us of it.

"This plant is of the ſame family with the former, and agrees with it in ſeveral reſpects; although they may be eaſily diſtinguiſhed from one another. Its leaves, like the former, in its natural ſtate, are always rounded, but much ſmaller; being little bigger than large horſe-hairs, or ſwines-briſtles, and ſeldom exceed ſix or ſeven inches in length. But theſe ſpring out of the root in tufts, ſo cloſe upon one another, that they reſemble, in this reſpect, a cloſe hair-bruſh more than any thing elſe I know: ſo that it would ſeem naturally adapted to form that thick ſhort pile of graſs in which ſheep are known chiefly to delight. Its flower-ſtalks are numerous, and ſometimes attain the height of two feet; but are more uſually about 12 or 15 inches high.

57 Its appearance when cultivated.

"Upon gathering the ſeeds of this plant, and ſowing them as the former, it was found that they ſprung up as quickly as any other kind of graſs; but the leaves are at firſt no bigger than a human hair. From each ſide ſprings up one or two of theſe hair-like filaments, that in a ſhort time ſend out new off-ſets, ſo as quickly to form a ſort of tuft, which grows larger and larger, till it at length attains a very large ſize, or till all the intervals are cloſed up, and then it forms the cloſeſt pile of graſs that it is poſſible to imagine. In April and May it puſhed forth an innumerable quantity of flower-ſtalks, that afforded an immenſe quantity of hay; it being ſo cloſe throughout, that the ſcythe could ſcarcely penetrate it. This was allowed to ſtand till the ſeeds ripened; but the bottom of the ſtalks were quite blanched, and almoſt rotted for want of air before that time.

"This

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"This was the appearance that it made the firft year after it was fowed: but I have reafon to think, that, after a few years, it likewife produces fewer feed-ftalks, and a greater quantity of leaves than at firft. But however that may be, it is certain, that if thefe are eat down in the fpring, it does not, like rye-grafs, perfift in a continued tendency to run to feed; but is at once determined to pufh forth a quantity of leaves without almoft any ftalks at all: and as all domeftic animals, but more efpecially fheep, are extremely fond of this grafs, if they have liberty to pafture where it grows, they bite it fo clofe as never to fuffer almoft a fingle feed-ftalk to efcape them; fo that the botanift will often fearch in vain for it, when he is treading upon it with his feet. The beft way to difcover it in any pafture, is to fearch for it in winter, when the tufts of it may be eafily diftinguifhed from every other kind of grafs, by their extraordinary clofenefs, and the deep green colour of the leaves.

What foil moft proper.

"It feems to grow in almoft any foil; altho' it is imagined that it would flourifh beft in a light fandy foil, as it can evidently live with lefs moifture than almoft any other kind of grafs; being often feen to remain in the fods that have been employed in coping for ftone-dykes, after all the other graffes that grew in them have difappeared. It is likewife found in poor barren foils, where hardly any other plant can be made to grow at all; and on the furface of dry worn-out peat-mofs, where no moifture remains fufficient to fupport any other plant whatever: but in neither of thefe fituations does it thrive; as it is there only a weak and unfightly plant, very unlike what it is when it has the good fortune to be eftablifhed upon a good foil; although it is feldomer met with in this laft ftate than in the former.

"I will not here repeat what has been already faid about the particular property that this plant poffeffes of continuing all winter; nor point out the benefits that the farmer may reap from this valuable quality.—He need not, however, expect to find any verdure in winter on fuch plants as grow upon the loofe moffy foil above-mentioned; for, as the froft in winter always hoves up the furface of this foil, the roots of the plants are fo lacerated thereby, as to make it, for fome time in the fpring, to all appearance dead. Nor will he often perceive much verdure in winter upon thofe plants that grow upon poor hungry foils, which cannot afford abundant nourifhment to keep them in a proper ftate of vegetation at all times: but fuch plants as grow on earthen dykes, which ufually begin to vegetate with vigour when the autumnal rains come on, for the moft part retain their verdure at that feafon almoft as well as if they were in good garden-mould.

"I have been very particular in regard to this plant; becaufe, in as far as my obfervations have yet gone, it promifes on many accounts to make a moft valuable acquifition to the farmer, and therefore juftly demands a very particular fhare of his attention."

59
Holcus lanatus.

3. The *holcus lanatus*, or creeping foft-grafs of Hudfon.—This is confidered by our author as one of the moft valuable kinds of meadow-graffes; its pile being exceedingly clofe, foft, and fucculent. It delights much in moifture, and is feldom found on dry ground, unlefs the foil is exceeding rich. It is often found on thofe patches near fprings, over which the water frequently flows; and may be known by the uncommon foftnefs and fucculence of the blade, the lively light green colour of the leaves, and the matted intertexture of its roots. But, notwithftanding the foftnefs of its firft leaves, when the feed-ftalks advance, they are rough to the touch, fo that the plant then affumes a very different appearance from what we would have expected. The ear is branched out into a great number of fine ramifications fomewhat like the oat, but much fmaller.—This kind of grafs, however, would not be eafily cultivated, on account of a kind of foft membrane that makes the feeds adhere to the ftalk, and to one another, after they are feparated from it, as if they were intermixed with cobweb, fo that it is difficult to get them feparated from the ftalk, or to fpread readily in fowing. It fpreads, however, fo faft by its running roots, that a fmall quantity fowed very thin, would be fufficient to ftock a large field in a fhort time.

Thefe are the kinds of *graffes*, properly fo called, which have not as yet been cultivated, that Mr Anderfon thinks the moft likely to be of value; but, befides thefe, he recommends the following, of the pea-tribe.

60
Milk-vetch.

1. *Milk-vetch, liquorice-vetch*, or *milkwort*. This plant, in fome refpects, very much refembles the common white clover; from the top of the root a great number of fhoots come out in the fpring, fpreading along the furface of the ground every way around it; from which arife a great many clufters of bright yellow flowers, exactly refembling thofe of the common broom. Thefe are fucceeded by hard round pods, filled with fmall kidney-fhaped feeds. From a fuppofed refemblance of a clufter of thefe pods to the fingers of an open hand, the plant has been fometimes called *ladies-fingers*. By others it is called *crow-toes*, from a fancied refemblance of the pods to the toes of a bird. Others, from the appearance of the bloffom, and the part where the plant is found, have called it *feal*, improperly *fell-broom*. It is found plentifully almoft every where in old grafs-fields; but as every fpecies of domeftic animals eat it, almoft in preference to any other plant, it is feldom allowed to come to the flower in pafture-grounds, unlefs where they have been accidentally faved from the cattle for fome time; fo that it is only about the borders of corn-fields, or the fides of inclofures to which cattle have not accefs, that we have an opportunity of obferving it. As it has been imagined that the cows which feed on thefe paftures, where this plant abounds, yield a quantity of rich milk, the plant has, from that circumftance, obtained its moft proper Englifh name of *milk-vetch*.

61
Its good qualities.

One of the greateft recommendations of this plant is, that it grows in poor barren ground, where almoft no other plant can live. It has been obferved in ground fo poor, that even heath, or ling (*erica communis*), would fcarcely grow; and upon bare obdurate clays, where no other plant could be made to vegetate; infomuch that the furface remained entirely uncovered, unlefs where a plant of this kind chanced to be eftablifhed; yet even in thefe unfavourable circumftances, it flourifhed with an uncommon degree of luxuriance, and yielded as tender and fucculent, though not fuch abundant fhoots, as if reared in the richeft manured fields. In dry barren fands, alfo, where almoft no other plant could be made to live, it has been found to fend out fuch a number of healthy fhoots all round, as to

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to cover the earth with the closest and most beautiful carpet that can be desired.

The stalks of the milk-vetch are weak and slender, so that they spread upon the surface of the ground, unless they are supported by some other vegetable. In ordinary soils they do not grow to a great length, nor produce many flowers; but in richer fields the stalks grow to a much greater length, branch out a good deal, but carry few or no flowers or seeds. From these qualities our author did not attempt at first to cultivate it with any other view than that of pasture; and, with this intention, sowed it with his ordinary hay seeds, expecting no material benefit from it till he desisted from cutting his field. In this, however, he was agreeably disappointed; the milk-vetch growing, the first season, as tall as his great clover, and forming exceeding fine hay; being scarce distinguishable from lucerne, but by the slenderness of the stalk, and proportional smallness of the leaf.

Another recommendation to this plant is, that it is perennial. It is several years after it is sowed before it attains to its full perfection; but, when once established, it probably remains for a great number of years in full vigour, and produces annually a great quantity of fodder. In autumn 1773, Mr Anderson cut the stalk from an old plant that grew on a very indifferent soil; and after having thoroughly dried it, he found that it weighed 14 ounces and a half.

The stalks of this plant die down entirely in winter, and do not come up in the spring till the same time that clover begins to advance; nor does it advance very fast, even in summer, when once cut down or eat over: so that it seems much inferior to the abovementioned grasses; but might be of use to cover the worst parts of a farm, on which no other vegetable could thrive.

62 Yellow vetchling.

2. The *common yellow vetchling*, (*Lathyrus pratensis*) or *everlasting tare*, grows with great luxuriance in stiff clay soils, and continues to yield annually a great weight of fodder, of the very best quality, for any length of time. This is equally fit for pasture, or hay; and grows with equal vigour in the end of summer as in the beginning of it; so would admit being pastured upon in the spring, till the middle, or even the end of May, without endangering the loss of the crop of hay. This is an advantage which no other plant except clover possesses; but clover is equally unfit for early pasture or for hay. Sain-foin is the only plant whose qualities approach to it in this respect, and the yellow vetchling will grow in such soils as are utterly unfit for producing sain-foin.—It is also a perennial plant, and increases so fast by its running roots, that a small quantity of the seed would produce a sufficient number of plants to fill a whole field in a very short time. If a small patch of good ground is sowed with the seeds of this plant in rows, about a foot distance from one another, and the intervals kept clear of weeds for that season, the roots will spread so much as to fill up the whole patch next year; when the stalks may be cut for green fodder or hay. And if that patch were dug over in the spring following, and the roots taken out, it would furnish a great quantity of plants, which might be planted at two or three feet distance from one another, where they would probably overspread the whole field in a short time.

63 Blue tare.

3. The *common blue tare* seems more likely than the former to produce a more nourishing kind of hay, as it abounds much more in seeds; but as the stalks come up more thinly from the root, and branch more above, it does not appear to be so well adapted for a pasture-grass as the other. The leaves of this plant are much smaller, and more divided, than those of the other; the stalks are likewise smaller, and grow to a much greater length. Though it produces a great quantity of seeds, yet the small birds are so fond of them, that, unless the field was carefully guarded, few of them would be allowed to ripen.

64 Bush-vetch.

4. The *Vicia sepium, purple everlasting*, or *bush-vetch*. Our author gives the preference to this plant beyond all others of the same tribe for pasture. The roots of it spread on every side a little below the surface of the ground, from which, in the spring, many stems arise quite close by one another; and as these have a broad tufted top covered with many leaves, it forms as close a pile as could be desired. It grows very quickly after being cut or cropt, but does not arrive at any great height; so that it seems more proper for pasturage than making hay; altho', upon a good soil, it will grow sufficiently high for that purpose; but the stalks grow so close upon one another, that there is great danger of having it rotted at the root, if the season should prove damp. It seems to thrive best in a clay soil.

65 Everlasting pea.

Besides these, there are a variety of others of the same class, which he thinks might be useful to the farmer. The common garden everlasting pea, cultivated as a flowering-plant, he conjectures, would yield a prodigious weight of hay upon an acre; as it grows to the height of ten or twelve feet, having very strong stalks, that could support themselves without rotting till they attained a great height.

66 Achillæa millefolium.

One other plant, hitherto unnoticed, is recommended by our author to the attention of the farmer; it is the *common yarrow*, (*Achillea millefolium*), or *hundred-leaved grass*. Concerning this plant, he remarks, that, in almost every fine old pasture, a great proportion of the growing vegetables with which the field is covered, consists of it; but the animals which feed there are so fond of the yarrow, as never to allow one seed-stalk of it to come to perfection. Hence these seed-stalks are never found but in neglected corners, or by the sides of roads; and are so disagreeable to cattle, that they are never tasted; and thus it has been erroneously thought that the whole plant was refused by them.—The leaves of this plant have a great tendency to grow very thick upon one another, and are therefore peculiarly adapted for pasturage. It arrives at its greatest perfection in rich fields that are naturally fit for producing a large and succulent crop of grass. It grows also upon clays; and is among the first plants that strike root in any barren clay that has been lately dug from any considerable depth; so that this plant, and thistles, are usually the first that appear on the banks of deep ditches formed in a clayey soil. All animals delight to eat it; but, from the dry aromatic taste it possesses, it would seem peculiarly favourable to the constitution of sheep. It seems altogether unfit for hay.

67 Lucerne.

Besides these plants, which are natives of our own country, there are others, which, though natives of a foreign climate, are found to thrive very well in Britain; and have been raised with such success by individuals,

Theory. viduals, as highly to merit the attention of every farmer. Among these the first place is claimed by lucerne.

This is the plant called *medica* by the ancients, because it came originally from Media, and on the culture of which they bestowed such great care and pains. It hath a perennial root, and annual stalks, which, in good soil, rise to three feet, or sometimes more in height; its leaves grow at a joint like those of clover; the flowers which appear in June, are purple, and its pods of a screw-like shape, containing seeds which ripen in September. All sorts of domestic cattle are fond of this plant, especially when allowed to eat it green, and black cattle may be fed very well with the hay made from it; but an excess of this food is said to be very dangerous.

Lucerne has the property of growing very quickly after it is cut down, insomuch that Mr Rocque has mowed it five times in a season, and Mr Anderson affirms he has cut it no less than six times. It is, however, not very easily cultivated; in consequence of which it sometimes does not succeed; and as it dies entirely in the winter, it is perhaps inferior to the fescue grasses already mentioned, which, tho' despised and neglected, might probably yield as rich a crop as lucerne, with-
68 out any danger of a miscarriage.

Timothy-grass.

Another grass was brought from Virginia, where it is a native, and sown by Rocque in 1763. This grass is called *Timothy*, from its being brought from New-York to Carolina by one Timothy Hanson. It grows best in a wet soil; but will thrive in almost any. If it is sown in August, it will be fit for cutting in the latter end of May or beginning of June. Horses are very fond of it, and will leave lucerne to eat it. It is also preferred by black cattle and sheep; for a square piece of land having been divided into four equal parts, and one part sowed with lucerne, another with sain-foin, a third with clover, and the fourth with timothy, some horses, black cattle, and sheep, were turned into it, when the plants were all in a condition for pasturage; and the timothy was eaten quite bare, before the clover, lucern, or sain-foin, was touched.

One valuable property of this grass is, that its roots are so strong and interwoven with one another, that they render the wettest and softest land, on which a horse could not find footing, firm enough to bear the heaviest cart. With the view of improving boggy lands, therefore, so as to prevent their being poached with the feet of cattle, Mr Anderson recommends the cultivation of this kind of grass, from which he has little expectation in other respects.

Sect. VII. *Of the Diseases of Plants.*

These are divided by Tournefort into the following classes. 1. Those which arise from too great an abundance of juice; 2. From having too little; 3. From its bad qualities; 4. From its unequal distribution; and
69 5. From external accidents.

Effects of too great an abundance of juices.

Too great an abundance of juices causes at first a prodigious luxuriant growth of the vegetable; so that it does not come to the requisite perfection in a due time. Wheat is subject, in some climates, to a disease of this kind; it vegetates excessively, without ever carrying ripe grain; and the same disease may be artificially produced in any grain, by planting it in too rich a soil. Too much rain is apt likewise to do the same. When a vegetable is supplied too abundantly with juices, it is very apt to rot; one part of it overshadowing another in such a manner as to prevent the access of fresh air; upon which putrefaction soon ensues, as has been already observed with regard to the fescue grasses. 70

Smut in grain.

In grass, or any herbaceous plant, where the leaves are only wanted, this over luxuriancy cannot be called a disease, but is a very desirable property; but in any kind of grain, it is quite otherwise. Dr Home, in his Principles of Agriculture and Vegetation, classes the *smut* in grain among the diseases arising from this cause. He is of opinion, that too great an abundance of juices in a vegetable will produce diseases similar to those occasioned by repletion in animal-bodies; viz. stagnations, corruptions, varices, cariosities, &c. along with the too great luxuriancy we have just now mentioned, which he expresses by "too great an abundance of water-shoots." Hence he is induced to class the smut among diseases arising from this cause; it being a corruption happening most in rainy seasons, and to weak grain.—Like other contagious diseases, he tells us, the smut may be communicated from the infected to health- 71
ful grain. As a preventative, he recommends steeping the grain in a strong pickle of sea-salt. Besides the effect which this has upon the grain itself, it is useful for separating the good from the bad; the best seed falling to the bottom, and the faulty swimming on the top of the liquor.—For the same purpose, a ley of wood-ashes and quicklime is recommended by some; and, by others, a solution of saltpetre or copperas; after which the grain is to be dried with slacked lime, or dry turf ashes. This solution, however, we can by no means recommend, as it seems most likely to kill the grain entirely. 72

How prevented.

Diseases from too great moisture, how prevented.

According to Dr Home, dung is a preventative of diseases arising from too great moisture; in confirmation of which, he relates the following experiment. "Two acres of poor ground, which had never got any manure, were fallowed with a design to be sown with wheat; but the scheme being altered, some dung was laid on a small part of it, and the whole sowed, after it had got five furrows, with barley. A great quantity of rain fell. The barley on that part which was dunged was very good; but what was on the rest of the field turned yellow after the rains, and when ripe was not worth the reaping." 73

Disease peculiar to saffron.

The want of nourishment in plants may be easily known by their decay; in which case, the only remedy is, to supply them with food, according to the methods we have already directed, or to remove from their neighbourhood such other plants as may draw off the nourishment from those we wish to cultivate.—In the Memoirs of the Academy of Sciences for 1728, Mr Du Hamel mentions a disease, which he calls *le mort*, that attacks saffron in the spring. It is owing to another plant, a species of trefoil, fixing some violet-coloured threads, which are its roots, to the roots of the saffron, and sucking out its juice. This disease is prevented by digging a trench, which saves all the unaffected. 74

Vegetables destroyed by insects.

The bad qualities, or unequal distributions, of the juices of plants, are the occasion of so few of the diseases to which vegetables in this country are subject, that we forbear to mention them at present. Most of the diseases of our plants are owing to external accidents, particularly to the depredations of insects.—The insects by which the greatest devastations are committed in this country are, snails, caterpillars, grubs, and flies. The snails and caterpillars feed on the leaves and young shoots;

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ſhoots; by which means they often totally deſtroy the vegetable. Where the plants are of eaſy acceſs, theſe vermin may be deſtroyed by ſprinkling the vegetable with lime-water; for quick-lime is a mortal poiſon to creatures of this kind, and throws them into the greateſt agonies the moment they are touched with it. On trees, however, where this method cannot ſo well be followed, fumigation is the moſt proper; and, for this purpoſe, nothing is better than the ſmoke of vegetables not perfectly dry. In ſome caſes the eggs of theſe deſtroying creatures may be obſerved, and ought without doubt immediately to be taken away. On the fruit trees, as apples, pears, medlars, on ſome foreſt-trees, the oak and dwarf-maple eſpecially, and the white and black thorn in hedges, a kind of little tufts are to be obſerved, reſembling, at firſt ſight, withered leaves twiſted, by a cobweb, about the uppermoſt twigs or branches. Theſe contain a vaſt number of little black eggs, that in the ſpring produce ſwarms of caterpillars which devour every thing. To prevent this, all the twigs on which theſe cobwebs appear ſhould be taken off and burnt as ſoon as poſſible. This ought to be done before the end of March, that none of the eggs be allowed ſufficient time for hatching.

75 Inſects deſtroyed by lime-water.

76 Grubs.

The grubs are a kind of worms which deſtroy the corn by feeding upon its roots; they are transformed every fourth year into the beetles called *cock-chaffers*, *may-bugs*, &c. they are very deſtructive when in their vermicular ſtate, and cannot then be deſtroyed becauſe they go deep in the ground. When become beetles, they conceal themſelves under the leaves of trees, where they ſeem aſleep till near ſunſet, when they take their flight. It is only now that they can be deſtroyed, and that by a very laborious method; namely, by ſpreading pack-ſheets below the trees in the day-time when the beetles are in their torpid ſtate, then ſhaking them off and burning them. Some time ago, they made ſuch devaſtations in the county of Norfolk, that ſeveral farmers were entirely ruined by them; one gathered 80 buſhels of theſe inſects from the trees which grew on his farm. It is ſaid that, in 1574, there fell ſuch a multitude of theſe inſects into the river Severn, that they ſtopped and clogged the wheels of the water-mills.

77 Turnip-fly.

Turnips, when young, are apt to be totally deſtroyed by a multitude of little black flies, from thence called the *turnip-fly*. As a preventative of theſe, ſome adviſe the ſeed to be mixed with brimſtone; but this is improper, as brimſtone is found to be poiſonous to vegetables. The beſt method ſeems to be the fumigation of the fields with ſmoke of half-dried vegetables. For this purpoſe weeds will anſwer as well as any. This fumigation muſt no doubt be often repeated, in order to drive away the innumerable multitudes of theſe inſects which are capable of deſtroying a large field of turnip.

78 Prevented by fumigation, &c.

Some have ſuppoſed that the fly is either engendered in new dung, or enticed by it; and have therefore adviſed the manure to be laid on in the autumn preceding, by which it loſes all its noxious qualities, while its nutritive ones are retained, notwithſtanding theſe might be ſuppoſed liable in ſome degree to be exhaled by the ſun. This method is ſaid to have been aſcertained by experiments; and it is added, that another material advantage accruing from autumn manuring for turnips is, that all the ſeeds contained in the dung, and which of courſe are carried on the land with it, vegetates almoſt immediately, are moſtly killed by the ſeverity of the winter, and the few that remain ſeldom avoid deſtruction from the plough-ſhare.

79 Various remedies againſt the turnip-fly.

The following method of ſowing has alſo been recommended as a preventative of the fly:—"About Midſummer, take the firſt opportunity when it rains, or there is an apparent certainty of rain approaching, to ſow your turnip ſeed; if about the full moon, the better. In this caſe, neither harrow, bruſh, nor roll, after ſowing. The natural heat of the ground at that ſeaſon, and the conſequent fermentation occaſioned by copious rain, will give an aſtoniſhingly quick vegetation to the ſeed, which in a few days will be up and out of all danger from the fly. At all events, ſow not till it rains; it is better to wait a month, or even longer, for rain, than to ſow (merely for the ſake of ſowing about the uſual time) when the ground is parched with heat. By the ſcorching of the ſun, the oil and vegetative quality of the ſeed are exhauſted; and the few weak plants that come up will be deſtroyed by the fly before they can attain ſtrength to put forth their rough leaves. The fly infeſts the ground abundantly in dry hot weather, but do no injury in rain. The falling rain will ſufficiently waſh the turnip-ſeed into the ground without harrowing it in; which, inſtead of merely covering, too often buries this ſmall ſeed at ſo great a depth, as never afterwards to get above ground."

The following remedies are alſo recommended as having often proved ſucceſsful:—A ſmall quantity of ſoot ſown over the land at their firſt appearance. Branches of elder with the leaves bruiſed, drawn in a gate over them. Muſk mixed with the ſeed before it is ſown. And ſulphur burnt under it, after moiſtening it with water in which tobacco has been ſteeped.

But ſhowers on the plants as ſoon as they appear above ground, are eſteemed the beſt preſervatives. They enfeeble and kill the fly, and haſten the plants into the rough leaf, in which ſtate they are out of danger.

The ſweet ſmell of the turnip has been thought to attract the fly; upon which ſuppoſition, the remedy appeared to conſiſt in overpowering that ſmell by one which is ſtrong, fetid, and diſagreeable. Hence it has been recommended, that upon an acre of turnips ſown in the uſual way, a peck or more of dry ſoot be thrown after the ground is finiſhed, and in as regular a way as he ſows the feed.

80 Corn butterfly.

Some time ago an inſect, called the *corn-butterfly*, committed ſuch ravages while in its vermicular ſtate, in France, that upwards of 200 pariſhes were ruined by it; and the miniſtry offered a reward to the diſcoverer of an effectual remedy againſt this deſtroying worm. The cure which was at laſt diſcovered, was to heat the corn, in an oven, ſo much as not to deſtroy its vegetative power, but ſufficiently to deſtroy the ſmall worms which made their neſt in the ſubſtance of the grain, and at laſt eat out the ſubſtance ſo completely that nothing could be got from the huſk, even by boiling it in water. It is certain, that though inſects can bear a great deal of cold, they are eaſily deſtroyed by a ſlight degree of heat; nor is the vegetative power of corn eaſily deſtroyed, even when kept for a long time in a pretty ſtrong heat. This method muſt therefore be very effectual for deſtroying all kinds of

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insects with which grain is apt to be infected: but care must be taken not to apply too great a heat; and the adjusting of the precise degree necessary to destroy the insect, without hurting the corn, will be attended with some difficulty.

81 The curled disease in potatoes.

The curled disease in potatoes has long been a subject of investigation and experiment among farmers; and the knowledge of its cause and cure seems yet to remain a desideratum. The Agriculture Society at Manchester, a few years ago, offered a premium for discovering by actual experiment the cause of the disease in question; and a great variety of letters were, in consequence, addressed to them upon the subject.—As these contain many interesting observations both on the disease itself and the best methods hitherto adopted for preventing it, the following abstract of them may not improperly be introduced in this place.

82 Various methods of prevention.

I. According to the writer of the first letter, this disease is caused by an insect produced by frost or bad keeping before setting; and the newest kinds, such as have been raised within these nine or ten years, are most apt to curl, because they will not stand to be kept in winter and spring before setting, as the old kinds will. In autumn 1776, he got up a bed of potatoes to lay by in winter, leaving plenty in the ground as regular as possible; and, before the severity of winter came on, covered part of the bed with straw and pease-haulm, and left the other part of the bed uncovered. That part of the bed which was covered was quite free from curled ones; but the uncovered part produced a great many curled, owing, as the writer says, to frost and severity of the weather.

II. This writer had about a quarter of an acre of potatoes, well manured with cow and horse dung, and took the greatest care in picking the fine smooth-skinned potatoes for sets; yet nine out of ten parts were curled. He attributes the cause of this disease to a white grub or insect, which he found near the root, about half an inch long, with eight or ten legs, its head brown and hard; as upon examining a number of the curled roots, he found them all bitten, chiefly from the surface to the root, which of course stopped the progress of the sap, and threw the leaf into a curl. The uncurled roots were not bitten. He tried a few experiments as follow:—First, he put soot to the insects in the rows for two days; and after that, he put lime to them for the same time, but they still kept lively; next he put a little salt, which destroyed them in a few hours. From which he infers, that if coarse salt were put into the ground at the time the land is preparing for potatoes, it would effectually cure this distemper.

III. In this letter, the cause of the disease is attributed to the method of earthing the stems while in cultivation; and the branch, striking root into the new earthed-up soil, it is said, produces potatoes of such a nature as the year following to cause the disease complained of.

To prevent the disease, it is recommended to take the sets from those potatoes that have not bred any from the branch covered; or otherwise, to dig the part the sets are to be raised from.

IV. According to this writer, the disorder proceeds from potatoes being set in old-tilled or worn-out ground; for though those potatoes may look tolerably well, yet their sets will most, if not all, produce curled potatoes. Hence he is convinced, that no sets ought to be used from old-tilled or couch-grass land; and that, in order to have good sets, they should be procured from land that was purposely fallowed for them; from fresh ley land, where they are not curled; or from ley land that was burnt last spring. He directs to plant them on virgin mould, and the potatoes will have no curled ones amongst them; and to keep them for winter, from any other kind.

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To avoid the uncertainty of getting good sets, he recommends crabs to be gathered from potatoes growing this year on fresh land free from curl, and the next spring to sow them on fresh ley land; and continue to plant their sets on fresh ley land yearly, which he is convinced will prevent the curl.

All the good potatoes he saw this year, either on fresh ley land or on old-tilled land, were raised from sets that grew upon fresh ley land last year; and where he has seen curled potatoes, he found, upon inquiry, the potato-sets grew upon old-tilled and worn-out land last year. He gives as a general reason for the disorder, that the land is oftener cropt than it had used to be, much more corn being now raised than formerly.

V. In 1772, this writer planted some potatoes by accident full nine inches deep: when taken up, many of the plants were rotted, and a few curled. He kept the whole produce for seed, and planted two acres with it in 1773, not quite six inches deep. The crop was amazingly great; and he did not observe any curled plants among them. In 1774, many of these were planted in different soils; yet they were so infected with the curled disease, that not one in twenty escaped. In 1775, the complaint of this disease became general. In 1776, it occurred to him that the good crop of 1773 was owing to the accidental deep setting of 1772; and that the reason why the same seed became curled in 1774, was their being set so near the surface in 1773; and attributes the disease to the practice of ebb-setting. In 1777, he took some potatoes from a crop that was curled the year before, and after cutting the sets, left them in a dry room for a month. Half were planted in ground dug fourteen days before; the other half, having been steeped in a brine made of whitster's ashes for two hours, were also planted in the same land at the same time. The steeped ones came up ten days before the others, and hardly any missed or were curled. The unsteeped ones generally failed, and those few that came up were mostly curled.

He therefore advised as a remedy, 1. That the potatoes intended for next year's sets be planted nine inches deep. 2. That they remain in the ground as long as the season will permit. 3. That these sets be well defended from frost till the beginning of March. 4. That the sets be cut a fortnight before planting. 5. That they be steeped, as above, two hours in brine or ley. 6. That the dung be put *over* the sets. And 7. That fresh sets be got every year from sandy soils near the coast, or on the shore.

P. S. At planting, the hard dry sets should be cast aside, for they will probably be curled. Curled potatoes always proceed from sets which do not rot or putrefy in the ground.

VI. This writer had five drills of the old red potatoes, and four of the winter whites, growing at the same time in the same field. The drills were prepared

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exactly alike. Among the red not one was curled; the winter whites were nearly all curled. He ſays he has found by experience, that the red never curl.

VII. Two of the writer's neighbours had their ſets out of one heap of potatoes. They both ſet with the plough, the one early, and the other late in the ſeaſon. Moſt of thoſe early ſet proved curled, and moſt of thoſe ſet late ſmooth; the latter on clay land.

A few roods of land were alſo planted with ſmall potatoes, which had lain ſpread on a chamber floor all the winter and ſpring, till the middle of May. They were ſoft and withered; they proved ſmooth and a good crop. Middle-ſized potatoes, withered and ſoft, which had been kept in a large dry cellar, and the ſprouts of which had been broken off three times, produced alſo a ſmooth good crop.

Hence he was led to think a ſuperfluity of ſap, occaſioned by the ſeed being unripe, might cauſe the diſeaſe. To be ſatisfied in this, he aſked the farmer whether he had ſet any of the ſame potatoes this year, and what was the nature of his land? He told him "he had; that they had been ſet on his farm fourteen years, without ever curling; that his ſoil was a poor whitiſh ſand, of little depth; that he let thoſe he deſigned for keeping grow till they were fully ripe."

Hence he concludes, the only ſure way to prevent the curl is, to let potatoes intended for ſeed ſtand till they are fully ripe, and to keep them dry all winter.

VIII. This writer ſet a quantity of the red potatoes, without having a curled one amongſt them. His method is, when the ſets are cut, to pick out ſuch as are reddeſt in the inſide. On digging them up at Michaelmas, he mixes none of the curled ſeed among the others. The curled are eaſily diſtinguiſhed, by their ſtalks withering two months before the reſt of the crop.

The cauſe of the curled diſeaſe he attributes to potatoes being of late years produced from ſeed inſtead of roots, as formerly. Such will not ſtand good more than two or three years, uſe what method you pleaſe. Laſt ſpring, he ſet the old red and white ruſſets, and had not a curled potato amongſt them.

On the lime-ſtone land about Denbigh, in North Wales, they have no curled potatoes. If this be owing to the nature of that land, perhaps lime might prevent the diſeaſe.

IX. According to this writer, all ſorts of grain wear out and turn wild if ſown too long on the ſame land; the ſame will hold good in all ſorts of pulſe, peaſe, beans, and (as he conceives) potatoes. It generally happens, that thoſe who have moſt curled potatoes plant very ſmall ſets.

Eleven years ago he bought a parcel of freſh ſets, of the golden-dun kind, and has uſed them without change to the preſent year, without any being curled. This he principally attributes to his having always planted good large ſets.

About four years ſince, he thought of changing his ſets, as his potatoes were too ſmooth, too round, and much diminiſhed in ſize. But the curl at that time beginning to be very alarming, he continued his ſets till part of his crop miſſing laſt year, he was obliged to buy new ſets this ſpring, which, being ſmall, were curled like other peoples.

He allows, that the curl has frequently happened to perſons who have uſed large potatoes for ſets; for, as all roots are not equally affected, ſome curled ones may be mixed with the reſt.

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To prevent the evil, cut your ſets from clear and middle-ſized potatoes, gathered from places as clear of the curl as poſſible; preſerve them as uſual till ſpring. If any are harder, or graſh more in cutting than uſual, caſt them aſide. He would alſo recommend the raiſing a freſh ſort from the crab produced on the ſorts leaſt affected, which in Lancaſhire are the long-duns.

X. Set potatoes with the ſprits broke off, and they will (ſays the writer of this letter) be curled ones; if ſet with the ſprits on, they will not be curled. Again, take a potato which is ſprit, and cut a ſet off with two ſights: break one ſprit off, and let the other ſtay on, and ſet it; the former will be curled, and the latter will not.

When you have holed your potatoes, take them out before they are ſprit, and lay them dry until you have ſet or ſown them, and you will have no curled potatoes.

XI. This writer was at the expence of procuring ſets at fifty miles diſtance, and where this diſeaſe was not known. The firſt year's trial was ſucceſsful; the year following he procured ſets from the ſame place, but one-fifth of his crop was infected. By way of experiment, he planted ſets from roots which had been infected the year before, and ſome of theſe produced healthy plants, free from all infection.

As every effect muſt have a cauſe, he ſuppoſed it might be ſome inſect, which, living on the leaves, gave them that curled and ſickly appearance, as is the caſe in the leaves of many ſhrubs and trees. But whether the inſect is lodged in the old ſets, and to be deſtroyed at the time of planting, or, proceeding from ſome external cauſe, can only be deſtroyed afterwards, he is not yet certain, although he has made the following experiments.

On a piece of ground that had not been dug for 20 years, he planted four rows of ſets, which he knew to be perfectly clear; the drills were two feet diſtant, the ſets one foot diſtant in each drill. He then planted on the ſame ground four rows with ſets from curled potatoes, at equal diſtances; in each row were about 20 ſets.

Lot 1ſt, the curled ſtate.

N° 1. Without manure,	N° 3. In ſoot,
2. In ſalt,	4. In quicklime.

Lot 2d, the clear ſets.

N° 1. Without manure,	N° 3. In ſoot,
2. In ſalt,	4. In quicklime.

Thoſe planted in ſalt and ſoot in both lots were deſtroyed. In lot 1. n° 1. and 4. all curled. Lot 2. n° 1. and 4. quite clear.

This experiment was made on a ſuppoſition that the inſect lodged in the ſet, and muſt be deſtroyed on planting. But of that he is not fully ſatisfied. He repeated ſalt, ſoot, and quicklime, on the branches of ſeveral curled potatoes. Salt deſtroyed all he touched with it. Lime and ſoot had, he thought, a partial effect on the plants. After ſome time, they appeared almoſt as healthy as the reſt. Thus, although he had done little towards the cure, he flatters himſelf he has pointed

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pointed out the cauſe, the inſects on the curled plants being not only very numerous, but viſible to the naked eye.

XII. This writer aſcribes the cauſe of the diſeaſe to the froſt, and bad keeping in winter and ſpring before ſetting. They are liable to be damaged by froſt after they are ſet, but this may be prevented by covering. If it be aſked, why froſt did not injure them formerly? he anſwers, it is only the NEW kinds which are apt to curl. To this may be added, that leſs care is now taken of the ſeed than formerly. To prevent the latter, let them remain in the ground covered with haulm or litter, till the time they are wanted for ſetting; and, in caſe no froſt touches them afterwards, they will be free from the diſeaſe.

XIII. This writer ſays, the red potato was as generally planted as the winter-white and the Lincolnſhire kidney are now. The firſt, being a later potato, did not ſprout ſo ſearly as the others. The white ſprout very early, and therefore ſhould firſt be moved out of the place where they have been preſerved in the winter. Inſtead of that, they are often let remain till their roots and ſprouts are matted together. On ſeparating them, theſe ſprouts are generally rubbed off, and they are laid by till the ground is ready; during which interval they ſprout a ſecond time: but theſe ſecond ſprouts, being weak and languid, will ſhrink, ſicken, and die; and the fruit at the roots will be ſmall, hard, ill ſhaped, and of a brown colour.

Now, if putting off the ſprouts once or more, before the ſets are put in the ground, be the cauſe (as he verily believes it is) of the curled diſeaſe, an eaſy remedy is at hand. When the potatoes intended for ſets are dug up, lay them in a weſt aſpect as dry as poſſible: in ſuch a ſituation they will not ſprout ſo ſoon. The beſt time for removing moſt ſorts, is the firſt fine day after the 24th of February. Cut them into ſets as ſoon as poſſible, and let them remain covered with dry ſand till the ground is prepared, which ſhould be a winter fallow. Lay the ſets in without breaking off any of the ſprouts, for the ſecond will not be ſo vigorous. This accounts for one ſprout out of three from the ſame ſet being curled. The two ſtems not curled roſe from two later eyes, and were firſt ſprouts. The ſprout curled was a ſecond, the firſt having been rubbed off.

XIV. This writer ſays, that laſt ſpring one of his neighbours cut and ſet, in the uſual way of drilling, ſome loads of the largeſt potatoes he could procure; and more than half of them proved curled. Being a few ſets ſhort of the quantity wanted, he planted ſome very ſmall potatoes which he had laid by for the pigs. Theſe being fully ripe and ſolid, there was not a curled plant among them. He apprehends, the others being curled was owing to their not being fully ripe. A crop of potatoes, ſet this year in rows on ground that had borne a crop of them laſt year, were moſtly curled; but many plants came up from ſeed left in the ground laſt ſeaſon, and there was not a curled one among them.

XV. Of late years, this writer ſays, great improvements have been made in ſetting potatoes and cutting the ſets. The ground is dreſſed cleaner and dunged ſtronger. Many people, in drilling, wrap up the ſets entirely in the dung; by which means, though their potatoes are larger, the diſeaſe ſeems to be encreaſed. They alſo cut their ſets out of the richeſt and largeſt potatoes, which is perhaps another cauſe of this evil. In cold countries, where they ſet their own ſeed, which has grown on poor land, with leſs dung, they have no curled plants. On the contrary, when they bought rich and large potatoes for ſeed, they have been curled in great quantities. He believes, the richneſs and largeneſs of the ſeed to be the cauſe of the evil; for he does not remember to have ſeen a curled ſtem which did not ſpring from a ſet of a large potato.

XVI. This writer apprehends the curled diſeaſe in potatoes to proceed from a defect in the *planta ſeminalis*, or ſeed-plant; and from comparing curled ones with others, there appeared to be a want of, or inability in, the powers of expanding or unfolding the parts of the former; which, from this defect, forms ſhrivelled, ſtarved, curled ſtems. On examining ſome of the ſets at the time of getting the crop, he found them hard and undecayed; ſo hard, indeed, that ſome of them would not be ſoft with long boiling. This led him to think, that ſome manures might have the ſame effect on them as tanners ooze has on leather, and ſo harden them, that the embryo plant could not come forth with eaſe; but a cloſer examination taught him otherwiſe, and that that they grow equally in all manures.

Some have thought that the fermentation is occaſioned by too great quantities being heaped together; but the writer has ſeen an inſtance, wherein a ſingle potato, preſerved by itſelf, when ſet, produced ſtems of the curled kind. He thinks the moſt conſiſtent and rational opinion is, that the diſeaſe is occaſioned by the potatoes being taken from the ground before the ſtamen, or miniature-plant, is properly matured and ripened.

For let it be obſerved, that the potato, being a native of a warmer climate, has there more ſun, and a longer continuance in the ground, than in its preſent exotic ſtate; conſequently, it has not the ſame natural cauſes here to mature the ſeed-plant as in its native ſtate. We ought, therefore, to give all the opportunities our climate will admit for nature to complete her work, and fit the ſtamen for the next ſtate of vegetation, eſpecially in thoſe intended for ſeed. But if the potato be taken up before the ſeed-plant be fully matured, or the air and ſap-veſſels have acquired a proper degree of firmneſs or hardneſs, it muſt, when thus robbed of further nutrition, ſhrivel up; and when the veſſels, in this immature ſtate, come to act again in the ſecond ſtate of vegetation, they may produce plants which are curled.

If it be aſked, why are they more common now than formerly? he anſwers, that before the preſent mode of ſetting them took place, people covered them, while in the ground, with ſtraw, to protect them from froſt.

If it be aſked, why one ſet produces both curled and ſmooth ſtems? he anſwers, we ſuppoſe every eye to contain a *planta ſeminalis*; that all the embryos, or ſeed-plants, contained in one potato, are nouriſhed by one root; that, as in ears of corn, ſome of theſe ſeed-plants may be nouriſhed before others.

One of his neighbours, laſt year, ſet two rows of potatoes,

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potatoes, which proving all curled, he did not take them up; and this year there is not a curled one among them. Such potatoes, therefore, as are designed for feed, should be preserved as long in the ground as possible.

XVII. This writer advises such sets to be planted as grow in moss-land; and, he says, there will not be a single curled one the first year. This is affirmed by the inhabitants of two townships, where they grow amazing quantities.—A medical gentleman sowed last year two bushels of sets from one of the above places, and had not one curled; but on sowing them again this year, he had a few.

Notwithstanding there seems to be a diversity of opinions in the above writers, occasioned by the different appearances of their crops, and the seemingly contrary effects of the means used to prevent or cure the disease, we conceive that the following general propositions may be fairly drawn from the whole. 1. That some kinds of potatoes are (*cæteris paribus*) much more liable to be affected by the disease than the rest; and that the old-red, the golden-dun, and the long-dun, are the most free from it.—2. That the disease is occasioned by one or more of the following causes, either singly or combined: 1st, By frost, either before or after the sets are planted: 2d, From planting sets out of large unripe potatoes: 3d, From planting too near the surface, and in old worn-out ground: 4th, From the first shoots of the sets being broken off before planting; by which means there is an incapacity in the *planta seminalis* to send forth others sufficiently vigorous to expand so fully as they ought.—3. That the most successful methods of preventing the disease, are cutting the sets from smooth middle-sized potatoes, that were fully ripe, and had been kept dry after they were taken out of the ground; and without rubbing off their first shoots, planting them pretty deep in fresh earth, with a mixture of quicklime, or on lime-stone land.

A correspondent of the Bath Society is convinced that, whatever may be its cause, the fault itself is inherent in the seed; and has communicated the following method of avoiding it: "I made a hot-bed in the following manner: (which method I have used ever since) I laid horse-dung, &c. (as is generally used in making hot-beds) about 18 inches thick; over which I spread a layer of fine rich mould about four or five inches thick: upon the top of this mould I laid, in different divisions, a certain number of potatoes of various sorts, some of my own growth, and others bought from different parts, and covered these lightly over with more mould; they soon came up. I then observed which was freest from the blight or curl; for if there were not more than one defective in *forty* or *fifty*, I concluded I might set of that sort with safety. This method I have now practised near twelve years, and never lost my crop or any part thereof worth mentioning; whilst my neighbours, who followed the old method, were frequently disappointed in their crops; and to the best of my knowledge, all those of my neighbours who have of late been persuaded to take the trouble of using the same means as myself, have never failed of success to their utmost wishes in one instance; nor do I ever think it will fail, if duly attended to; the fault being some hidden cause in the seed unknown at present, and I believe incurable by any means, at least which have yet come to my knowledge. My reason for planting my hot-beds so soon is, that if the frost hinders the first experiment, or they all prove bad, I may have time to make a second or third if necessary, with different sorts of seed, before the proper season arrives for planting in the fields and grounds appointed for the great and general crop."

PART II. PRACTICE OF AGRICULTURE.

SECT. I. *Instruments of Husbandry.*

THE instruments employed in agriculture are various; as the plough, the harrow, the roller, &c. which are again greatly diversified by various constructions adapted to particular uses.

1. Of PLOUGHS.

83 Scots plough.

THE plough constructed in the following manner is still the most common and the most generally understood in Scotland; and, if properly made, is the best for answering all purposes, when only one is used; though others are, perhaps, more proper on some particular occasions.

84 Description of the Scots plough.

The parts of which this plough is composed, are, the head, the beam, the sheath, the wrest, the mould-board, the two handles, the two rungs, the sock, and the coulter; the two last are made of iron, and all the rest of wood.

Plate IV. fig. 1.

The HEAD, is designed for opening the ground below. The length of the head from A to B is about 20 inches, and the breadth from A to D about five inches; C is the point upon which the sock is driven, and the length from B to C is about six inches; *a* is the mortoise into which the larger handle is fixed, and *b* is the mortoise into which the sheath is fixed.

The head is that part of the plough which goes in the ground; therefore the shorter and narrower it is, the friction will be the less, and the plough more easily drawn; but the longer the head is, the plough goes more steadily, and is not so easily put out of its direction by any obstructions that occur. Twenty inches is considered as a mean length; and five inches as the most convenient breadth.

The SHEATH, E, is driven into the mortoise *b*, and thus fixed to the head A B. It is not perpendicular to the head, but placed obliquely, so as to make the angle formed by the lines A B and E B about 60 degrees. The sheath is about 13 inches long, besides what is driven into the mortoise *b* (fig. 1.); about three inches broad, and one inch thick. Fig. 2.

The sheath is fixed to the mould-board, as in fig. 11. E, in the same manner as the wrest is fixed to the head in fig. 7.

The MOULD-BOARD, is designed to turn over the earth of the furrow made by the plough; and it is obvious, that, according to the position of the sheath, the mould-board will turn over the earth of the furrow more or less suddenly. Besides, when it forms a less angle with the head than 60 degrees, the plough is in great danger of being *choked*, as the farmers term it. Fig. 3.

The

Practice. The Larger HANDLE, F A, is fixed to the head, by driving it into the mortoiſe *a* (fig. 1.). It is placed in the ſame plane with the head; and its length from A F is about five feet four inches, and its diameter at the place where it is fixed to the beam is about two inches and an half, and tapers a little to the top F. About ten inches from A, there is a curve in the handle, which, when F is raiſed to its proper height, makes the lower part of it nearly parallel to the ſheath E B. This curve is deſigned to ſtrengthen the handle. The proper poſition of the handle is, when the top F is about three feet two inches higher than the bottom of the head A B.

Fig. 3.

The longer the handles, the plough is the more eaſily managed, becauſe the levers are more diſtant from the centre of motion. The higher the top of the handles, the plough is more eaſily raiſed out of the ground, provided they be no higher than the lower part of a man's breaſt.

Fig. 4. The BEAM, is fixed to the larger handle and the ſheath, all of which are placed in the ſame plane with the head. The length of it, from H to I, is about ſix feet; its diameter is about four inches. When the plough is in the ground, the beam ſhould be juſt high enough not to be incommoded by any thing on the ſurface.

The poſition of the beam depends on the number of cattle in the plough. When two horſes are yoked, the beam ſhould be placed in ſuch a manner as to make the perpendicular diſtance betwixt the bolt-hole of the beam and the plane of the head about 21 inches; when four horſes are yoked, two a-breaſt, this diſtance ſhould only be about 18 inches.

Fig. 5. The SOCK, BP, is fixed to the end of the head, and is about two feet long. In fitting the ſock to the head, the point ought to be turned a little to the land or left ſide; becauſe otherwiſe it is apt to come out of the land altogether. When turned to the left, it likewiſe takes off more land; when turned upwards, the plough goes ſhallow; and when downwards, it goes deeper.

Fig. 6. The COULTER, is fixed to the beam, and is about two feet ten inches long, two inches and a half broad, ſharp at the point and before, and thick on the back, like a knife. It is fixed and directed by wedges, ſo as to make the point of it equal to, or rather a little before the point of the ſock, and upon a line with the left ſide of the head. This oblique poſition enables it to throw roots, &c. out of the land, which requires leſs force than cutting or puſhing them forward.

Fig. 7. The WREST, BD, is fixed to the head, and is about 26 inches long, two broad, and one thick. It is fixed to the head at B, in ſuch a manner as to make the angle contained between the lines AB and BD about 25 degrees. The wreſt is ſeldom or never placed in the ſame plane with the head, but gradually raiſed from the place where it is fixed to it; that is, from B to K, as in fig. 8. The poſition of the wreſt determines the nature of the furrow. When the wreſt is wide and low ſet, the furrow is wide; and when it is narrow and high ſet, the furrow is narrow.

Fig. 9. repreſents the two HANDLES, fixed together by the two rungs. The larger handle has already been deſcribed; the leſſer one is a few inches ſhorter, and does not require to be quite ſo ſtrong. The diſtance of the handles at the little rung depends on the poſition of the wreſt. Their diſtance at M and P is about two feet ſix inches. The leſſer handle is fixed to the mould board at M, fig. 10. and to the wreſt K B, at L. Practice.

Fig. 11. repreſents the plough complete, by joining together figures 6. and 10. in the ſheath E B. The wreſt B K is ſuppoſed to make an angle with the head A B as in fig. 7. and the handles joined together as in fig. 9.

After having given ſuch a particular deſcription of all the parts and proportions of the Scots plough, it will eaſily appear how it ſeparates, raiſes, and turns over the earth of the furrow. If it had no coulter, the earth would open above the middle of the ſock, and in a line before the ſheath; but as the coulter opens the earth in a line with the left ſide of the head, if the ſoil has any cohesion, the earth of the furrow will be wholly raiſed from the left ſide, and, as the ſock moves forward, will be thrown on the right ſide of the ſheath, and by the caſting out of the mould-board, or the raiſing of the wreſt, will be turned over.

The BRIDLE, or MUZZLE, is another article belonging to the plough. It is fixed to the end of the beam, and the cattle are yoked by it. The muzzle commonly uſed is a curved piece of iron, fixed to the beam by a bolt through it. A B C is the muzzle, A C the bolt by which it is fixed to the beam; D is the ſwingle-tree or croſs-tree, to which the traces are fixed; and B is a hook, or *cleek*, as it is commonly called, which joins the muzzle and ſwingle-tree. Fig. 12.

Some uſe another kind of muzzle, A B C D. It is fixed to the beam by two bolts, and has notches by which the cleek of the ſwingle-tree may be fixed either to the right or the left of the beam. There are alſo different holes for the hind-bolt to paſs thro', by which the draught may be fixed either above or below the beam. A D is the fore-bolt upon which the muzzle turns; on B C are four notches, betwixt any two of which the cleek of the ſwingle-tree may be fixed. When the cleek is fixed at B, the plough is turned towards the firm land, and takes off a broader furrow; and when fixed at C, it is turned towards the ploughed land, and takes of a narrower furrow. E and F are the holes on each ſide thro' which the hindmoſt bolt paſſes. When the bolt is put thro' the higheſt two, theſe holes being thereby brought to the middle of the beam, the fore-part of the muzzle is raiſed above the beam, and the plough is made to go deeper; and when put through the loweſt two, the fore-part of the muzzle is ſunk below the beam, and the plough is made to go ſhallower. This muzzle may be ſo conſtructed as to have the ſame play with the common one. A is the end of the beam; B a plate of iron ſunk into it, and, with a ſimilar one in the other ſide, is rivetted into it by bolts; C is the muzzle fixed to theſe plates of iron by the bolt D, which bolt may be put through any of the holes E E. From the conſtruction of this muzzle it is plain, that it has the ſame play with the common one, and that by it the land of the plough may be altered at pleaſure. Fig. 13. Fig. 16.

85 Properties of the Scots plough.

Of all forms, that of the Scotch plough is the fitteſt for breaking up ſtiff and rough land, eſpecially where ſtones abound; and no leſs fit for ſtrong clays hardened by drought. The length of its head gives it a firm hold of the ground; its weight prevents it from being thrown out by ſtones; the length of the handles gives the ploughman great command to direct its mo-

Practice. tion; and by the length of its head, and of its mould-board, it lays the furrow-slice cleverly over. This plough was contrived during the infancy of agriculture, and was well contrived: in the soils above described, it has not an equal.

86 In what soil improper. But in tender soil it is improper, because it adds greatly to the expence of ploughing, without any counterbalancing benefit. The length of the head and mould-board increases the friction, and consequently it requires a greater number of oxen or horses than are necessary in a shorter plough. There is another particular in its form, that resists the draught: the mould-board makes an angle with the sock, instead of making a line with it gently curving backward. There is an objection against it no less solid, that it does not stir the ground perfectly: the hinder part of the wrest rises a foot above the sole of the head; and the earth that lies immediately below that hinder part, is left unstirred. This is ribbing land below the surface, similar to what is done by ignorant farmers on the surface.

These defects must be submitted to in a soil that requires a strong heavy plough; but may be avoided in a cultivated soil by a plough differently constructed. Of all the ploughs fitted for a cultivated soil free of stones, that introduced into Scotland about 20 years ago, by James Small in Blackadder Mount, Berwickshire, is the best. It is now in great request; and with reason, as it avoids all the defects of the Scots plough. The shortness of its head and of its mouldboard lessen the friction greatly: from the point of the sock to the back part of the head it is only 30 inches; and the whole length, from the point of the beam to the end of the handles, between eight and nine feet. The sock and mouldboard make one line gently curving; and consequently gather no earth. Instead of a wrest, the under edge of the mouldboard is in one plain with the sole of the head; which makes a wide furrow, without leaving any part unstirred. It is termed the *chain-plough*, because it is drawn by an iron chain fixed to the back part of the beam immediately before the coulter. This has two advantages: first, by means of a muzzle, it makes the plough go deep, or shallow; and, next, it stresses the beam less than if fixed to the point, and therefore a slenderer beam is sufficient.

87 Chain-plough. Plate V. fig. 1.

This plough may well be considered as a capital improvement; not only by saving expence, but by making better work. It is proper for loams; for carse-clays; and, in general, for every sort of tender soil free of stones. It is even proper for opening up pasture-ground, where the soil has been formerly well cultivated.

88 Of the Sock. Plate IV. A spiked sock is used in the Scotch plough. The difference between it and the feathered sock will be best understood by comparing their figures. Fig. 14. is the common sock, and fig. 15. the feathered one.

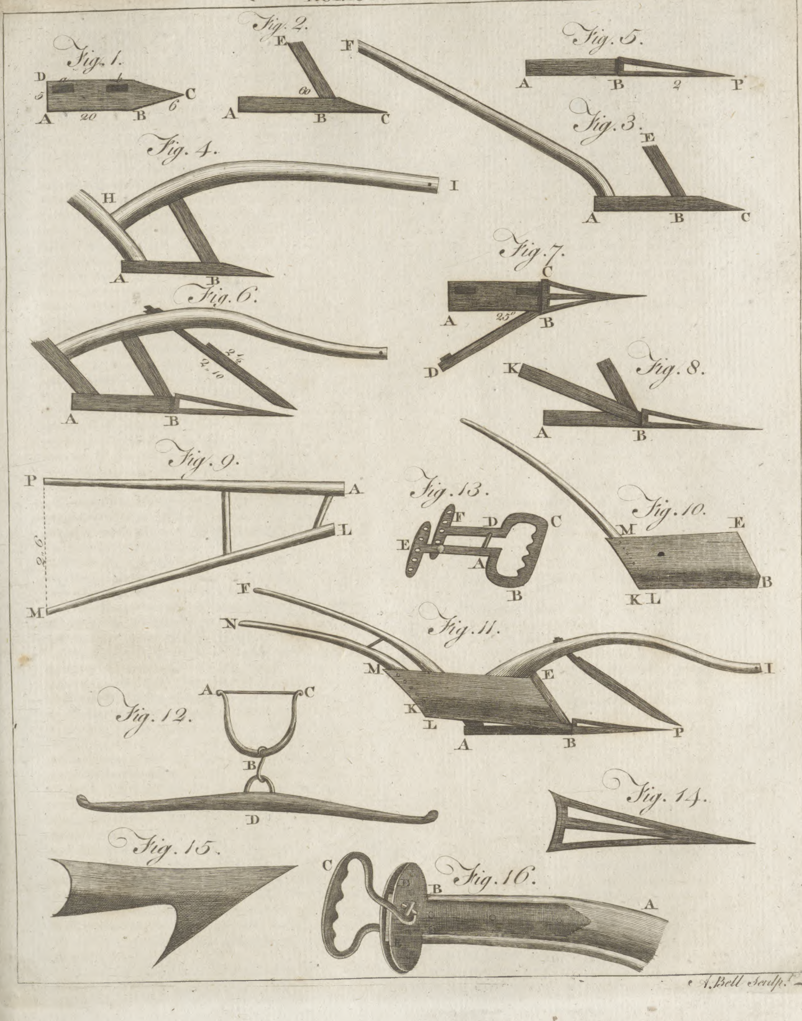
From the construction of the feathered sock, it is obvious, that it must meet with greater resistance than the common sock. However, when the plough takes off the earth of the furrow broader than that part of the sock which goes upon the head, it is more easily drawn than the plough with the common sock; for the earth which the common sock leaves to be opened by the wrest, is more easily opened by the feather of the other sock. In lea, the feathered sock makes the plough go more easily, because the roots of the grass, which go beyond the reach of the plough, are more easily cut by the feather, than they can be torn asunder by the common sock. The feathered sock is also of great use in cutting and destroying root-weeds. The common sock, however, answers much better in strong land.

It is proper here to add, that in fitting the feathered sock to the head, the point of it should be turned a little from the land, or a little to the right hand.

89 Ignorance of farmers in Scotland but a few years ago. If we look back 30 years, ploughs of different constructions did not enter even into a dream. The Scotch plough was universally used, and no other was known. There was no less ignorance as to the number of cattle necessary for this plough. In the south of Scotland, six oxen and two horses were universal; and in the north, 10 oxen, sometimes 12. The first attempt to lessen the number of oxen was in Berwickshire. The low part of that county abounds with stone, clay, and marl, the most substantial of all manures, which had been long used by one or two gentlemen. About 25 years ago it acquired reputation, and spread rapidly. As two horses and two oxen were employed in every marl-cart; the farmer, in summer-fallowing, and in preparing land for marl, was confined to four oxen and two horses. And as that manure afforded plenty of succulent straw for oxen, the farmer was surprised to find that four oxen did better now than six formerly. Marling, however, a laborious work, proceeded slowly, till people were taught by a noted farmer in that country, what industry can perform by means of power properly applied. It was reckoned a mighty task to marl five or six acres in a year. That gentleman, by plenty of red clover for his working-cattle, accomplished the marling 50 acres in a summer, once 54. Having so much occasion for oxen, he tried with success two oxen and two horses in a plough; and that practice became general in Berwickshire.

90 Advantage of the chain-plough particularly illustrated. Now here appears with lustre the advantage of the chain-plough. The great friction occasioned in the Scotch plough by a long head, and by the angle it makes with the mould-board, necessarily requires two oxen and two horses, whatever the soil be. The friction is so much less in the chain-plough, that two good horses are found sufficient in every soil that is proper for it. Besides, the reducing the draught to a couple of horses has another advantage, that of rendering a driver unnecessary. This saving on every plough, where two horses and two oxen were formerly used, will, by the strictest computation, be L. 15 Sterling yearly; and where four horses were used, no less than L. 20 Sterling. There is now scarce to be seen in the low country of Berwickshire a plough with more than two horses; which undoubtedly in time will become general. We know but of one further improvement, that of using two oxen instead of two horses. That draught has been employed with success in several places; and the saving is so great, that it must force its way every where. It may be confidently affirmed, no soil stirred in a proper season, can ever require more than two horses and two oxen in a plough, even supposing the stiffest clay. In all other soils, two good horses, or two good oxen abreast, may be relied on for every operation of the chain-plough.

A chain-plough of a smaller size than ordinary, drawn



A. Bell Sculp.t

Practice. drawn by a single horse, is of all the most proper for horse-hoeing, supposing the land to be mellow, which it ought to be for that operation. It is sufficient for making furrows to receive the dung, for ploughing the drills after dunging, and for hoeing the crop.

91 A small single-horse plough recommended for various purposes.

A still smaller plough of the same kind may be recommended for a kitchen-garden. It can be reduced to the smallest size, by being made of iron; and where the land is properly dressed for a kitchen-garden, an iron plough of the smallest size drawn by a horse will save much spade-work.—In Scotland, thirty years ago, a kitchen-garden was an article of luxury merely, because at that time there could be no cheaper food than oat-meal. At present, the farmer maintains his servants at double expence, as the price of oat-meal is doubled; and yet he has no notion of a kitchen-garden more than he had thirty years ago. He never thinks, that living partly on cabbage, kail, turnip, carrot, would save much oat-meal: nor does he ever think, that change of food is more wholesome, than vegetables alone, or oat-meal alone. We need not recommend potatoes, which in scanty crops of corn have proved a great blessing: without them, the labouring poor would frequently have been reduced to a starving condition. Would the farmer but cultivate his kitchen-garden with as much industry as he bestows on his potatoe crop, he needed never fear want; and he can cultivate it with the iron plough at a very small expence. It may be held by a boy of 12 or 13; and would be a proper education for a ploughman. But it is the landlord who ought to give a beginning to the improvement. A very small expence would inclose an acre for a kitchen-garden to each of his tenants; and it would excite their industry, to bestow an iron plough on those who do best.

Nor is this the only case where a single-horse plough may be profitably employed. It is sufficient for seed-furrowing barley, where the land is light and well-dressed. It may be used in the second or third ploughing of fallow, to encourage annual weeds, which are destroyed in subsequent ploughings.

92 Rotheram Plough, Plate VI. fig. 3.

The *Rotheram plough* is a machine of very simple construction, and easily worked. AB is the beam, CD the sheath, EBD the main handle, FR the smaller handle, GH the coulter, KI the sock or share, NP the bridle, S the sly-band, and ML a piece of wood in place of a head. The whole of this plough should be made of ash or elm; the irons should be steeled and well-tempered; and that part of the plough which is under ground in tilling should be covered with plates of iron. The difference between this and the common plough seems to consist in the bridle at the end of the beam, by which the ploughman can give the plough more or less land by notches at N, or make it cut deeper or shallower by the holes at P; in the coulter or share, which are so made and set as to cut off the new furrow without tearing; and in the mould-board, which is so shaped at first to raise a little, and then gradually turn over the new cut furrow with very little resistance. But the greatest advantage attending it, is its being so easy of draught, that it will do double the work of any common plough.

The *Paring plough* is an instrument used in several parts of England for paring off the surface of the ground, in order to its being burnt. Mr Bradley has given the following description of a very simple instrument of this kind: From A to A (fig. 15.) is the plough-beam, about seven feet long, mortised and pinioned into the block B, which is of clean timber without knots. C C are the sheaths or standards, made flat on the inside, to close equally with the paring plate, and fastened to it with a bolt and key on each side, as at D. E is the paring plate of iron laid with steel, about four inches wide, and from 12 to 18 inches long. This plate must be made to cut on the sides, which are bolted to the standards as well as at the bottom part. F F are two iron braces to keep the standards from giving way: these standards must be mortised near their outsides and through the block. G G are the plough handles, which must be fixed slope-ways between the beam and the standards. The pin-holes in the beam, the use of which is to make this plough cut more or less deep, by fixing the wheels nearer to or farther from the paring plate, should not be above two inches asunder.

93 The Paring Plough, Plate VI. fig. 4.

94 The Four-coultered Plough, Plate VI.

Fig. 1. represents the four-coultered plough of Mr Tull. Its beam is ten feet four inches long, whereas that of the common plough is but eight. The beam is straight in the common plough, but in this it is straight only from *a* to *b*, and thence arched: so that the line let down perpendicularly from the corner at *a*, to the even surface on which the plough stands, would be $11\frac{1}{2}$ inches; and if another line were let down from the turning of the beam at *b* to the same surface, it would be one foot eight inches and a half; and a third line let down to the surface from the bottom of the beam at that part which bears upon the pillow, will show the beam to be two feet ten inches high in that part. At the distance of three feet two inches from the end of the beam *a*, at the plough-tail, the first coulter, or that next the share, is let through; and at 13 inches from this, a second coulter is let through: a third at the same distance from that; and, finally, the fourth at the same distance from the third, that is, 13 inches: and from *a* to *b* is seven feet.

The crookedness of the upper part of the beam of this plough is contrived to avoid the too great length of the three foremost coulters, which would be too much if the beam was straight all the way; and they would be apt to bend and be displaced, unless they were very heavy and clumsy. Ash is the best wood to make the beam of, it being sufficiently strong, and yet light. The sheat in this plough is to be seven inches broad. The fixing of the share in this, as well as in the common plough, is the nicest part, and requires the utmost art of the maker; for the well-going of the plough wholly depends upon the placing this. Supposing the axis of the beam, and the left side of the share, to be both horizontal, they must never be set parallel to each other; for if they are, the tail of the share bearing against the trench as much as the point, would cause the point to incline to the right hand, and it would be carried out of the ground into the furrow. If the point of the share should be set so, that its side should make an angle on the right side of the axis of the beam, this inconvenience would be much greater; and if its point should incline much to the left, and make too large an angle on that side with the axis of the beam, the plough would run quite to the left hand; and

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and if the holder, to prevent its running quite out of the ground, turns the upper part of his plough towards the left hand, the pin of the ſhare will riſe up, and cut the furrow diagonally, leaving it half unploughed. To avoid this and ſeveral other inconveniences, the ſtraight ſide of the ſhare muſt make an angle upon the left ſide of the beam; but that muſt be ſo very acute a one, that the tail of the ſhare may only preſs leſs againſt the ſide of the trench than the point does. This angle is ſhown by the pricked lines at the bottom of fig. 9. where *ef* is ſuppoſed to be the axis of the beam let down to the ſurface, and *gf* parallel to the left ſide of the ſhare: and it is the ſubtenſe *eg* that determines the inclination which the point of the ſhare muſt have towards the left hand. This ſubtenſe, ſays Mr Tull, at the fore-end of an eight-feet beam, ſhould never be more than one inch and a half, and whether the beam be long or ſhort, the ſubtenſe muſt be the ſame.

The great thing to be taken care of, is the placing the four coulters; which muſt be ſo ſet, that the four imaginary places deſcribed by their four edges, as the plough moves forward, may be all parallel to each other, or very nearly ſo; for if any one of them ſhould be very much inclined to, or ſhould recede much from either of the other, then they would not enter the ground together. In order to place them thus, the beam muſt be carefully pierced in a proper manner. The ſecond coulter-hole muſt be two inches and a half more on the right hand than the firſt, the third muſt be as much more to the right of the ſecond, and the fourth the ſame meaſure to the right hand of the third; and this two inches and a half muſt be carefully meaſured from the centre of one hole to the centre of the other. Each of theſe holes is a mortiſe of an inch and quarter wide, and is three inches and a half long at the top, and three inches at the bottom. The two oppoſite ſides of this hole are parallel to the top and bottom, but the back is oblique, and determines the obliquity of the ſtanding of the coulter, which is wedged tight up to the poll. The coulter is two feet eight inches long before it is worn; the handle takes up ſixteen inches of this length, and is allowed thus long, that the coulter may be driven down as the point wears away. As to the wheels, the left hand wheel is 20 inches diameter, and that on the right hand two feet three inches, and the diſtance at which they are ſet from each other is two feet $5\frac{1}{2}$ inches.

2. The Patent Sward-cutter.

95 Patent Sward-cutter, Plate VI.

The different parts of this inſtrument are repreſented by N° 1. 2. 3. of fig. 6. A. A. &c. a ſquare frame 3 feet 4 inches from the fore to the hind part, by 4 feet 3 inches, the breadth of the machine within ſide; the timber (when of fir) 4 inches ſquare, placed on two wheels B. B. 3 feet diameter, a little more or leſs (the old fore-wheels of a chaiſe may anſwer the purpoſe), to ſupport the hind part of the machine.

C. C. &c. are ſix ſtrong pieces of wood, called *bulls*, 3 feet long, 5 inches and a half broad, the thickneſs 6 inches at E. and tapering to 3 inches at F. Into theſe bulls are fixed the cutting wheels, which are iron, 13 inches diameter, $\frac{3}{4}$ths of an inch thick at the centre, about an inch diameter for piercing holes to fix the iron axles in; from that they are to be of ſuch thickneſs, as allow the edges to be well ſteeled. The wheels are fixed by two bolts going through the bulls, with eyes on one end for the axles of the wheels to run in, and nuts and ſcrews on the other to make them very firm by ſunk in the bulls, to prevent their interfering with the weights L. L. &c. reſting on them.

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G. G. &c. are hollow pieces of wood, called *thorles*, each $3\frac{1}{2}$ inches long, which incloſe the bolt M. M. and keep the bulls C. C. &c. at their proper diſtances, but may be made longer or ſhorter at pleaſure, according as the ſward requires to be cut in larger or ſmaller pieces. They are in two pieces bound together, and jointed by a ſtrap of leather or cord, which allows them to be readily changed when the cutting wheels require to be kept at more or leſs diſtance.

The iron bolt M. M. goes through two pieces of wood or iron P. P. 7 inches long, clear of the wood, ſupported by iron ſtays fixed to the frame, and thro' all the bulls. It requires to be ſtrong, as the draught of the horſes terminate there.

H. H. N° 2. and 3. a cylinder or ſegment of wood, 7 inches diameter, called a *rocking tree*, which goes acroſs the frame, and moves on the pivots fixed into it, one at each end, ſupported by an iron bolt or piece of wood mortoiſed into the frame, 8 inches high, as appears in N° 2. and 3. to which 6 chains or ropes are fixed by hooks, at different diſtances, as you want your cuts, 9, 8, 7, or 6 inches from one another, and are joined to the end of each bull in which the cutting wheels run; ſo that when the rocking tree is turned about by the lever I. fixed in the middle of it, all the bulls, with their cutting wheels, are raiſed out of the ground at once, as in N° 3. by which means the machine may be turned, or moved from place to place with great eaſe, without any danger of ſtraining the wheels.

L. L. L. &c. N° 1. 2. 3. are weights of freeſtone, 26 inches long and 6 inches broad; the under one 4 inches thick, the upper one 3 inches thick; weighing about 64 lb. the under, and 48 the upper; each of them having two holes, through which iron ſpikes, firmly fixed in the bulls, paſs, in order to keep them ſteady.

When the ground is eaſily cut, the under ſtone may anſwer; when more difficult, the other ſtone may be added; ſo that every wheel may have 7 ſtone-weight upon it, which has been found ſufficient for the ſtiffeſt land and tougheſt ſward the machine has ever been tried on. Caſt iron weights will anſwer fully better, but are more expenſive.

The lever I. N° 2. 3. which ought to be 5 feet long, muſt have a ſliding rope on it; fixed to the back part of the frame; ſo that when the cutting wheels are all taken out of the ground three or four inches, by the rocking tree's being turned partly round by the lever, the rope may be fixed to it by a loop over the pin R. N° 3. (it ought to be placed 3 feet 4 inches from the extremity of the lever I.) Thus all the cutting wheels are kept out of the ground till the machine is turned; and then by moving the loop off the pin, it ſlips back towards the frame, and the lever is gently let back to its place, as in N° 2. by which the cutting wheels are put into their former poſture, by the weights fixed on the bulls in which they run. The levers may be made of good tough aſh.

P.P. N° 1

P. P. N° 1. a ſmall bolt of iron, with a hook on one end of it (one is ſufficient), to ſtrengthen the bolt M. M. to be hooked on the centre of it, and joined to the frame by a nut and ſcrew.

The grooves in which the cutting wheels run, may be covered below at the hinder part with a plate of thin black iron, 6 inches long, 3 inches broad, having a ſlit in it where the wheels run, to prevent (if found neceſſary) any graſs, weeds, or ſmall ſtones, from filling the grooves, and clogging the wheels.

To the frame N° 1. are fixed (for a double-horſe ſward-cutter) three ſhafts, as in a waggon, of ſuch length, ſtrength, and diſtance from one another, as any workman may think proper.

For a ſingle-horſe ſward-cutter (which has only four cutting wheels), a pair of ſhafts are uſed, and may make the two ſides of the frame without any joinings. The width of the frame, in proportion to the double-horſe ſward-cutter, is as four to ſix.

It is recommended for a double-horſe ſward-cutter to have eight bulls and wheels, in order that when it is uſed to reduce hard clody ſummer-fallow, or land for barley, before the laſt furrow, or even after it, the whole weight (42 ſtone) employed in cutting the ſtiffeſt land and tougheſt ſward, may be applied to the 8 bulls then at 6 inches from one another. The 64 lb. weights to be applied to ſix of the bulls, and two of the 48 lb. weights to each of the additional bulls, which is a ſufficient weight for the purpoſe, and will effectually prevent a clod of more than ſix inches breadth from eſcaping being broke to pieces.

In the ſame manner, a ſingle-horſe ſward-cutter may have ſix bulls for the above-mentioned purpoſe; the 28 ſtone belonging to it divided thus: The 64 lb. weights to four of the bulls, and two of the 48 lb. weights to each of the additional bulls.

That the machine may come as cheap as poſſible to the public, the inventor is of opinion, that the expence of the two wheels and the iron axle (which is conſiderable) may be ſaved, by joining ſtrongly to the frame at S. N° 3. a piece of wood with a little curve at the extremity of it, reſembling the foot of a ſledge, formerly much uſed in Scotland to carry in the corn from the field; the part of it reſting on the ground being kept 18 inches (the half diameter of the wheels) from the frame, by a ſtrong ſupport of wood.

As the two outer bulls next the frame are apt to get under it, ſo as to prevent the cutting wheels from being taken out of the ground, a thin ſlip of iron fixed to the inſide of the frame, nearly oppoſite to the back end of the bulls, of convenient length, will be found neceſſary.

The original intention of this machine was to prepare old graſs-ground for the plough, by cutting it acroſs the ridges, in the beginning of or during winter, when the ground is ſoft, in order to anſwer all the purpoſes that Mr Tull propoſed by his four-coulter plough above deſcribed, and ſo ſtrongly recommended by him for bringing into tilth graſs-ground that has been long reſted. This the ſward-cutter has been found to do much more effectually and expeditiouſly: For Mr Tull's machine cuts the ſward in the ſame direction with the plough; and is liable, from every obſtruction any of the coulters meet with, to be thrown out of its work altogether, or the inſtrument broken: to which the ſward-cutter, conſiſting of four, ſix, or more cutting wheels, is never liable, from theſe being entirely independent of one another, cutting the ground acroſs the ridges before ploughing, and rendering that operation eaſier to two horſes than it would be to three, without its being cut. The furrow being cut acroſs, falls finely from the plough in ſquares of any ſize required not under ſix inches, in place of long ſlips of tough ſward ſeldom and imperfectly broke by the four-coultered plough.

This inſtrument is very fit for preparing ground for burnbating, as it will ſave much hand-labour.

It may be properly uſed in croſs-cutting clover of one or two years ſtanding, to prepare the ground for wheat, if the land is ſtiff and moiſt enough.

It may be applied to cutting and croſs-cutting paſture-ground, intended to have manure of any kind put upon it to meliorate the graſs. In this it will far exceed the ſcarificator mentioned in one of Mr Young's tours; as that inſtrument is liable, as well as the four-coultered plough, to be thrown out of its work when meeting with a ſtone or other interruption. This the ſward-cutter is proof againſt, which is looked on as its greateſt excellence.

In preparing for barley, the ſward-cutter excels a roller of any kind in reducing the large hard clods in clay land, occaſioned by a ſudden drought, after its being ploughed too wet; and it is likewiſe very proper for reducing ſuch clay land when under a ſummer-fallow. In this operation, the ſward-cutter is grealy to be preferred to the cutting-roller, likewiſe mentioned by Mr Young in one of his tours; for the wheels of the latter being all dependent one on another, when one is thrown out by a ſtone, three or four muſt ſhare the ſame fate. Beſides, the cutting-roller has but ſeven wheels in ſix feet; whereas the ſward-cutter has ſix in four feet three inches, at nine inches diſtant; and, if neceſſary, may have them ſo near as ſix inches.

After old graſs-ground is cut acroſs with the ſward-cutter and ploughed, it has a very uncommon and worklike appearance, from each ſquare turned over by the plough being raiſed up an inch or two at the ſide laſt moved by the earth-board; ſo that the field, when finiſhed, is all prettily waved, and reſembles a piece of water when blown on by a gentle breeze. By this means a very great deal of the land's ſurface is expoſed to the froſt and other influences of the air, which cannot fail to have a good effect on it.

Two horſes are ſufficient for the draught of a double-horſe ſward-cutter, and one horſe for a ſingle-horſe one. One man manages the machine and drives the horſes. He begins his operation by firſt meaſuring off 20 or 30 paces from the machine, leſs or more as he inclines, and there fixes a pole. He then cuts the field croſs, as near at right angles with the ridges as he can. When the cutting wheels are paſt the laſt furrow about a yard or ſo, and the machine is upon the outmoſt ridge of the field on which it muſt turn, he muſt ſtop the horſes; then take hold of the lever I. N° 2. and by pulling it to him he raiſes the cutting wheels out of the ground, which are kept ſo by the loop of the rope being put over the pin R. in the lever I. N° 3. till the machine is turned and brought to its proper place, which is done by meaſuring off the ſame diſtance formerly

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merly done on the oppoſite ſide of the field. When the cutting wheels are exactly over the outmoſt furrow, then, on the horſes being ſtopped, the rop is ſlipt off the pin R. and the lever returned to its former place, as repreſented N°2. which allows the weights L. L. &c. to force the cutting wheels into the ground again. He then goes on till the interval betwixt the firſt and ſecond ſtroke of the machine is all cut. In this manner the field is to be finiſhed, after which you may begin to plough when you pleaſe. (N. B. There muſt be a pole at each ſide of the field.)

It is of no conſequence whether the land to be ſward-cut is in crooked ridges or ſtraight, in flat ridges or in very high raiſed ones. Be the ſurface ever ſo uneven, the cutting wheels, being all independent of one anothe, are forced by their weights into every furrow or hollow.

One ſward-cutter will cut as much in one day as ſix ploughs will plough.

The land may lie ſeveral months in winter after being ſward-cut, when there is no vegetation to make the cuts grow together again before it is ploughed; but the ſooner it is ploughed after cutting the better, that it may have the benefit of all the winter's froſt, which makes it harrow better at ſeed-time.

When the ground is harrowed, the harrows ought to go with the waves which appear after ploughing, not againſt them, as by that means they are leſs apt to tear up the furrows all cut into ſquares. This, however, need only be attended to the two firſt times of harrowing, as they are called.

Any common wright and ſmith may make the inſtrument. It is very ſtrong, very ſimple, and eaſily managed and moved from place to place; and, if put under cover, will laſt many years.

It was invented ſome time ago by the Honourable Robert Sandilands; and is repreſented in the Plate as it has been lately improved by him, the price being at the ſame time reduced from L. 15 or L. 16 to L. 5 or L. 6.

3. The Brake.

96 Brake deſcribed, Plate V. fig. 2.

The brake is a large and weighty harrow, the purpoſe of which is to reduce a ſtubborn ſoil, where an ordinary harrow makes little impreſſion. It conſiſts of four ſquare bulls, each ſide five inches, and ſix feet and a half in length. The teeth are 17 inches long, bending forward like a coulter. Four of them are inſerted into each bull, fixed above with a ſcrew-nut, having 12 inches free below, with a heel cloſe to the under part of the bull, to prevent it from being puſhed back by ſtones. The nut above makes it eaſy to be taken out for ſharping. This brake requires four horſes or four oxen. One of a leſſer ſize will not fully anſwer the purpoſe: one of a larger ſize will require ſix oxen; in which caſe the work may be performed at leſs expence with the plough.

97 Uſes.

This inſtrument may be applied to great advantage in the following circumſtances. In the fallowing ſtrong clay that requires frequent ploughings, a brakeing between every ploughing will pulverize the ſoil, and render the ſubſequent ploughings more eaſy. In the month of March or April, when ſtrong ground is ploughed for barley, eſpecially if bound with couch-graſs, a croſs-brakeing is preferable to a croſs-ploughing, and is done at half the expence. When ground is ploughed from the ſtate of nature, and after a competent time is croſs-ploughed, the brake is applied with great ſucceſs, immediately after the croſs-ploughing, to reduce the whole to proper tilth.

Let it be obſerved, that a brake with a greater number of teeth than above-mentioned, is improper for ground that is bound together by the roots of plants, which is always the caſe of ground new broken up from its natural ſtate. The brake is ſoon choked, and can do no execution till freed from the earth it holds. A leſs number of teeth would be deficient in pulverizing the ſoil.

4. The Harrow.

Harrows are commonly conſidered as of no uſe but to cover the ſeed; but they have another uſe ſcarce leſs eſſential, which is to prepare land for the ſeed. This is an article of importance for producing a good crop. But how imperfectly either of theſe purpoſes is performed by the common harrow, will appear from the following account of it.

The harrow commonly uſed is of different forms. 98 Imperfection of the common harrow.
The firſt we ſhall mention has two bulls, four feet long and 18 inches aſunder, with four wooden teeth in each. A ſecond has three bulls and 12 wooden teeth. A third has four bulls, and 20 teeth of wood or iron, 10, 11, or 12 inches aſunder. Now, in fine mould, the laſt may be ſufficient for covering the ſeed; but none of them are ſufficient to prepare for the ſeed any ground that requires ſubduing. The only tolerable form is that with iron teeth; and the bare deſcription of its imperfections will ſhow the neceſſity of a more perfect form. In the firſt place, this harrow is by far too light for ground new taken up from the ſtate of nature, for clays hardened with ſpring-drought, or for other ſtubborn ſoils: it floats on the ſurface; and after frequent returns in the ſame tract, nothing is done effectually. In the next place, the teeth are too thick ſet, by which the harrow is apt to be choked, eſpecially where the earth is bound with roots, which is commonly the caſe. At the ſame time, the lightneſs and number of teeth keep the harrow upon the ſurface, and prevent one of its capital purpoſes, that of dividing the ſoil. Nor will fewer teeth anſwer for covering the ſeed properly. In the third place, the teeth are too ſhort for reducing a coarſe ſoil to proper tilth; and yet it would be in vain to make them longer, becauſe the harrow is too light for going deep into the ground. Further, the common harrows are ſo ill conſtructed, as to ride at every turn one upon another. Much time is loſt in diſengaging them. Laſtly, it is equally unfit for extirpating weeds. The ground is frequently ſo bound with couch-graſs, as to make the furrow-ſlice ſtand upright, as when old lea is ploughed: notwithſtanding much labour, the graſs-roots keep the field, and gain the victory.

A little reflection, even without experience, will make it evident, that the ſame harrows, whatever be the form, can never anſwer all the different purpoſes of harrowing, nor can operate equally in all different ſoils, rough or ſmooth, firm or looſe. The following, therefore, have been recommended; which are of three different

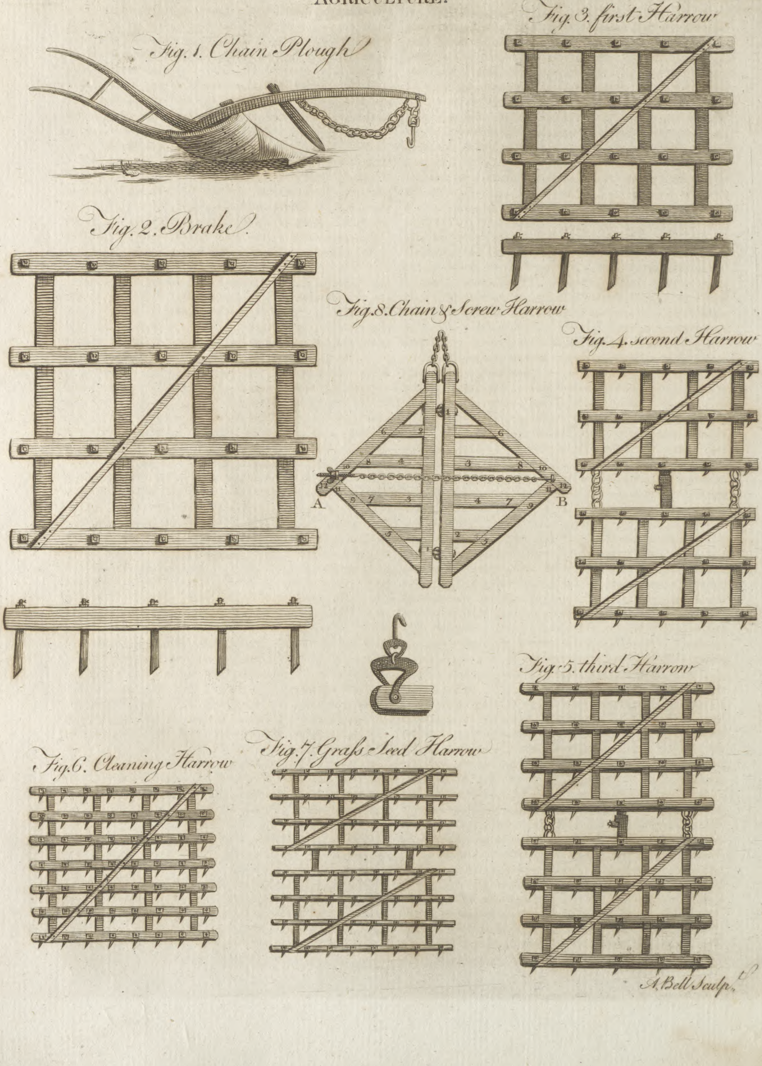
Fig. 1. Chain Plough
Fig. 2. Brake
Fig. 3. first Harrow
Fig. 4. second Harrow
Fig. 5. third Harrow
Fig. 6. Cleaning Harrow
Fig. 7. Grass Seed Harrow
Fig. 8. Chain & Screw Harrow
A
B
A. Bell Sculpt.

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99 Improved harrows. Plate V. fig. 3. Birch is the best wood for them, because it is cheap, and not apt to split. The first is composed of four bulls, each four feet ten inches long, three and a quarter inches broad, and three and a half deep; the interval between the bulls 11 and three-fourths inches; so that the breadth of the whole harrow is four feet. The bulls are connected by four sheths, which go thro' each bull, and are fixed by timber-nails driven through both. In each bull five teeth are inserted, ten inches free under the bull, and ten inches asunder. They are of the same form with those of the brake, and inserted into the wood in the same manner. Each of these teeth is three pounds weight; and where the harrow is made of birch, the weight of the whole is six stone 14 pounds, Dutch. An erect bridle is fixed at a corner of the harrow, three inches high, with four notches for drawing higher or lower. To this bridle a double tree is fixed for two horses drawing abreast, as in a plough. And to strengthen the harrow, a flat rod of iron is nailed upon the harrow from corner to corner in the line of the draught.

Fig. 4. The second harrow consists of two parts, connected together by a crank or hinge in the middle, and two chains of equal length, one at each end, which keep the two parts always parallel, and at the same distance from each other. The crank is so contrived, as to allow the two parts to ply to the ground like two unconnected harrows; but neither of them to rise above the other, more than if they were a single harrow without a joint. In a word, they may form an angle downward, but not upward. Thus they have the effect of two harrows in curved ground, and of one weighty harrow in a plain. This harrow is composed of six bulls, each four feet long, three inches broad, and three and a half deep. The interval between the bulls nine and a half inches; which makes the breadth of the whole harrow, including the length of the crank, to be five feet five inches. Each bull has five teeth, nine inches free under the wood, and ten inches asunder. The weight of each tooth is two pounds; the rest as in the former.

Fig. 5. The third consists also of two parts, connected together like that last mentioned. It has eight bulls, each four feet long, two and a half inches broad, and three deep. The interval between the bulls is eight inches; and the breadth of the whole harrow, including the length of the crank, is six feet four inches. In each bull are inserted five teeth, seven inches free under the wood, and ten and a half inches asunder, each tooth weighing one pound. The rest as in the two former harrows.

100 Properties of these harrows. These harrows are a considerable improvement. They ply to curved ground like two unconnected harrows; and when drawn in one plain, they are in effect one harrow of double weight, which makes the teeth pierce deep into the ground. The imperfection of common harrows, mentioned above, will suggest the advantages of the set of harrows here recommended. The first is proper for harrowing land that has long lain after ploughing, as where oats are sown on a winter-furrow, and in general for harrowing stiff land: it pierces deep into the soil by its long teeth, and divides it minutely. The second is intended for covering the seed: its long teeth lays the seed deeper than the common harrow can do; which is no slight advantage. By placing the seed considerably under the surface, the young plants are, on the one hand, protected from too much heat, and, on the other, have sufficiency of moisture. At the same time, the seed is so well covered that none of it is lost. Seed slightly covered by the common harrows wants moisture, and is burnt up by the sun; beside, that a proportion of it is left upon the surface uncovered. The third harrow supplies what may be deficient in the second, by smoothing the surface, and covering the seed more accurately. The three harrows make the ground finer and finer, as heckles do lint; or, to use a different comparison, the first harrow makes the bed, the second lays the seed in it, the third smooths the cloaths. They have another advantage not inferior to any mentioned: they mix manure with the soil more intimately than can be done by common harrows; and upon such intimate mixture depends greatly the effect of manure, as has already been explained. To conclude, these harrows are contrived to answer an established principle in agriculture, That fertility depends greatly on pulverizing the soil, and on an intimate mixture of manure with it, whether dung, lime, marl, or any other.

The Chain and Screw Harrow. Fig. 8. is the plan of a harrow also invented by Mr Sandilands, and to which he has given the name of the *chain and screw harrow.* Its properties are, that if your ridges be high, and you wish to harrow them from one end to the other, by lengthening the chain (which the screw commands), the harrow, when drawn along, forms an angle downwards, and misses none of the curve of the ridge, so far as it extends (which may be nine feet, the distance from A to B. The extent, in the contrary direction, is five feet six inches). When the crowns of the ridges have got what is thought sufficient harrowing lengthwise, you shorten the chain by the screw, which forms an angle upwards: the harrow is then drawn by the horses, one on each side of the furrow; which completely harrows it, and the sides of the ridge, if 18 feet broad. Plate V.

When you want to harrow even ground or high ridges across with the screw, you can bring the harrow to be horizontal, so as to work as a solid harrow without a joint.

The teeth are formed and fixed in the common manner, square, not in the fashion of coulters; and are nine or ten inches below the wood, and of such strength as it is thought the land requires. The teeth cut, or rather tear, the ground at every four inches without variation, though seemingly placed irregularly; and this without any risk of choking, except sometimes at the extreme angles, where the teeth are necessarily near other; but which may be cleaned with the greatest ease, by raising them a little from the ground. The figures 1, 2, &c. point out where the 12 teeth on each side of the harrow are placed.

Where a strong brake-harrow is not necessary, by making the teeth shorter and lighter, you may have 48 teeth, which will tear the ground at every two inches, cover the seed well, and make a fine mould.

It is recommended, that harrows for every purpose, and

Practice. and of any fize, be made on the above principle; by which no tooth can ever follow the track of another, and all of them will be kept conftantly acting.

5. The Roller.

101 The roller. The roller is an inftrument of capital ufe in hufbandry, though fcarcely known in ordinary practice; and, where introduced, it is commonly fo flight as to have very little effect.

Rollers are of different kinds; ftone, caft-iron, wood. Each of thefe has its advantages. We would recommend the laft, conftructed in the following manner. Take the body of a tree, fix feet ten inches long, the larger the better, made as near a perfect cylinder as poffible. Surround this cylinder with three rows of fillies, one row in the middle, and one at each end. Line thefe fillies with planks of wood equally long with the roller, and fo narrow as to ply into a circle. Bind them faft together with iron rings. Beech-wood is the beft, being hard and tough. The roller thus mounted, ought to have a diameter of three feet ten inches. It has a double pair of fhafts for two horfes abreaft. Thefe are fufficient in level ground; in ground not level, four horfes may be neceffary. The roller without the fhafts ought to weigh 200 ftone Dutch; and the large diameter makes this great weight eafy to be drawn.

102 Seafon for rolling. Rolling wheat in the month of April is an important article in loofe foil; as the winter-rains preffing down the foil leave many roots in the air. Barley ought to be rolled immediately after the feed is fown; efpecially where grafs-feeds are fown with it. The beft time for rolling a gravelly foil, is as foon as the mould is fo dry as to bear the roller without clinging to it. A clay foil ought neither to be tilled, harrowed, nor rolled, till the field be perfectly dry. And as rolling a clay foil is chiefly intended for fmoothing the furface, a dry feafon may be patiently waited for, even till the crop be three inches high. There is the greater reafon for this precaution, becaufe much rain immediately after rolling is apt to cake the furface when drought follows. Oats in a light foil may be rolled immediately after the feed is fown, unlefs the ground be fo wet as to cling to the roller. In a clay foil, delay rolling till the grain be above ground. The proper time for fowing grafs-feeds in an oat-field, is when the grain is three inches high; and rolling fhould immediately fucceed, whatever the foil be. Flax ought to be rolled immediately after fowing. This fhould never be neglected; for it makes the feed pufh equally, and prevents after-growth; the bad effect of which is vifible in every ftep of the procefs for dreffing flax. The firft year's crop of fown graffes ought to be rolled as early the next fpring as the ground will bear the horfes. It fixes all the roots precifely as in the cafe of wheat. Rolling the fecond and third crops in loofe foil is an ufeful work; though not fo effential as rolling the firft crop.

103 Effects of rolling. In the firft place, rolling renders a loofe foil more compact and folid; which encourages the growth of plants, by making the earth clap clofe to every part of every root. Nor need we be afraid of rendering the foil too compact; for no roller that can be drawn by two or four horfes will have that effect. In the next place, rolling keeps in the moifture, and hinders drought to penetrate. This effect is of great moment. In a dry feafon, it may make the difference of a good crop, or no crop, efpecially where the foil is light. In the third place, the rolling grafs-feeds, befide the foregoing advantages, facilitates the mowing for hay; and it is to be hoped, that the advantage of this practice will lead farmers to mow their corn alfo, which will increafe the quantity of ftraw both for food and for the dunghill. Practice.

There is a fmall roller for breaking clods in land intended for barley. The common way is, to break clods with a mell; which requires many hands, and is a laborious work. This roller performs the work more effectually, and at much lefs expence: let a harrowing precede, which will break the clods a little; and after lying a day, or a day and a half, to dry, this roller will diffolve them into powder. This however does not fuperfede the ufe of the great roller after all the other articles are finifhed, in order to make the foil compact, and to keep out the fummer-drought. A ftone roller four feet long, and fifteen inches diameter, drawn by one horfe, is fufficient to break clods that are eafily diffolved by preffure. The ufe of this roller in preparing land for barley is gaining ground daily, even among ordinary tenants, who have become fenfible both of the expence and toil of ufing wooden mells. But in a clay foil, the clods are fometimes too firm, or too tough, to be fubdued by fo light a machine. In that cafe, a roller of the fame fize, but of a different conftruction, is neceffary. It ought to be furrounded with circles of iron, fix inches afunder, and feven inches deep; which will cut even the moft ftubborn clods, and reduce them to powder. Let not this inftrument be confidered as a finical refinement. In a ftiff clay, it may make the difference of a plentiful or fcanty crop.

6. The Fallow-cleansing Machine.

This was invented by Mr Aaron Ogden, a fmith at Afhton-under-Line, near Manchefter in Lancafhire. It is intended for cleanfing fallows from weeds, &c. which exhauft the riches of the foil. A, A, is the frame; B, the firft roller; C, the fecond ditto; in which laft are two cranks to move the arms D, D, which work the rake up the directors fixed on the plank E. The under fide of the lower ends or fhares of thefe directors are fharp, to cut the clods and let them come on the upper fide. Each alternate heel of the fhare is longer than the intermediate one, that they may not have more than one-half to cut at once. At the back of the plank E are two fcrews to let it loofe, that the directors may be fet higher or lower. The fhares are to penetrate the ground two or three inches, to raife the quicks till the rake I, I, fetches them into the cart H, where a man muft be ready with a muck-hook to clear them backward when gathered. In the rake I are two teeth for every fpace of the directors, that ftones, &c. may be gathered without damage. K, K, are two ftaples, by which the machine is drawn: under them at *b* are two hooks, placed low to raife the machine in turning, by the help of the traces; and the axle-tree of the cart fhould be fixed upon a pin, that it may turn like a waggon. F, F, are the triggers to throw the rake behind the roots. The long teeth at G, G, are to cleanfe the roller C. I, I, is the rake which gathers up the weeds into 104 The fallow-cleanfing machine, Plate VI. fig. 5.

Practice into the cart H, and is drawn above the trigger F by the working of the arms D, expreffed by the dotted lines at *dd*, *i i i*. The triggers F, of which there is one on each fide, move on the pivots *a*; fo that when the points *b*, of the rake I, have been drawn up by the directors E to the part marked *c*, the trigger, giving way, permits the rake to pafs; but immediately falling, the rake returns along the upper furface of the trigger marked *e*, *e*, and of courfe falls on the weeds when it comes to the end, a little beyond the pivot *a*. The reader will obferve, that the boarding is taken away on one fide, in the Plate, in order to give a more perfect view of the inner parts of the machine; and in fact it would perhaps be better if all the boarding, marked L, L, L, was taken away, and frame-work put in its ftead. The cart H might undoubtedly alfo be made lighter. The wheels M, M, appear in the Plate to be made of folid wood; but there is no neceffity they fhould be fo. At N is another view of the roller C, by which the difpofition of the fpikes may be eafily comprehended. Suppofe the circle O, defcribed by the end of the roller N, to be divided by four ftrait lines into eight equal fegments, as reprefented at P. Let the fame be done at the other end of the roller, and parallel lines be drawn from one correfponding point to the other the length of the roller; mark the points with figures 1, 2, 3, 4, 5, 6, 7, 8; afterwards draw oblique lines, as from 1, at the end of O, to 2, at the other end, and from 2 to 3, &c. on thefe oblique lines the fpikes are to be fixed at equal diftances, in eight circles, defcribed on the circumference of the roller. The fpikes of the fmall roller B are fixed in the fame manner, except that the diameter being fmaller, there are only fix inftead of eight rows. R is another view of the directors, with the plank E on which they are fixed; and S is a fection of a part of the plank, with one of the directors as fixed, in which may be feen the heel *m*, from whence to the point of the fhare *n* is a fharp cutting edge. See the fame letters in figure R. At T is one of the long teeth to be feen at G; it is bent towards the roller C, which it ferves to cleanfe. When the end of the rake *b*, after rifing above *c*, is pufhed, by the motion of the arms D, D, along the upper part *e*, *e*, of the trigger F, and comes to the end beyond *a*; as it falls, the part of the arm marked *o* refts in the notch *p*, till it is again raifed by the motion of the roller C with the rake. The roller C is to be one foot diameter, the fpikes nine inches long, that they may go through the furrow (if the foil fhould be loofe) into the hard earth, the more effectually to work the rake, which otherwife might be fo overcharged as to caufe the roller to drag without turning. In the rake-ends *b* there fhould be pivots, with rollers or pullers on, to go in the groove, to take off the friction; and they would likewife take the triggers more furely as the rake comes back. The rake fhould alfo be hung fo far backwarder, that when it is fallen the arms of it may lie in the fame plane or parallel with the directors, on which it comes up (which will require the frame to be two inches longer in the model). This will caufe the rake to fall heavier, and drive the teeth into the roots, and bring them up without fhattering. Thefe teeth muft be made of fteel, very fine, and fo long as to reach down to the plank on which the directors are fixed, that is to fay, fix inches long (the directors are alfo to be made fix inches broad above the plank). The rake-head fhould alfo fall a little before the crank is at its extremity, which will caufe the rake to pufh forward to let the teeth come into the roots. The rake-teeth muft drop in the fame plane with the roller and wheels, or on the furface of the earth. No more fpace fhould be given from the roller C to the long teeth at G G than that the rake may juft mifs the fpikes of the roller C and fall on the places before mentioned. As the firft roller B was intended to cleanfe the fecond C more than for any other ufe, it may be omitted when the machine is made in large, as Mr Ogden has lately found that the long teeth at G G anfwer the end alone, and this renders the machine about a fixth part fhorter: Now, to fuit any fort of earth, there fhould be to each machine three planks, with directors at different fpaces, to ufe occafionally; in the firft, the fpaces between the directors fhould be eight inches wide, in the fecond fix, and the third four. This will anfwer the fame end as having fo many machines.

As there may be fome objections to the rake not leaving the roots when it has brought them up, Mr Ogden has feveral methods of cleanfing it; but as he would make it as fimple as poffible, he choofes to let it be without them at prefent; but fuppofe it fhould bring fome roots back again with it, it will probably lofe them before it gets back to the extremity; whence they will lie light, and be of but little detriment to the others coming up. Mr Ogden would have the firft machine made four feet fix inches wide, the teeth divided into equal fpaces, the outfides into half fpaces.

7. The new-invented Patent Univerfal SOWING *Machine*.

105 Univerfal fowing machine, 2d Plate VII. fig. 1. 2. 11.

THIS machine, whether made to be worked by hand, drawn by a horfe, or fixed to a plough, and ufed with it, is extremely fimple in the conftruction, and not liable to be put out of order; as there is but one movement to direct the whole, nor does it require any fkill in working. It will fow wheat, barley, oats, rye, clover, cole-feed, hemp, flax, canary, rape, turnip, befides a great variety of other kinds of grain and feeds broad-caft, with an accuracy hitherto unknown. It is equally ufeful in the new hufbandry, particularly when fixed to a plough; it will then drill a more extenfive variety of grain, pulfe, and feed (through every gradation, with regard to quantity), and deliver each kind with greater regularity than any drill-plough whatever. When ufed in this manner, it will likewife be found of the utmoft fervice to farmers who are partial to the old hufbandry, as, among many other very valuable and peculiar properties, it will not only fow in the broad-caft way with a moft fingular exactnefs, but fave the expence of a feedfman; the feed being fown (either over or under furrow at pleafure), and the land ploughed, at the fame operation.

Perhaps a fair and decifive experiment for afcertaining the fuperior advantage of broad-cafting or drilling any particular crop, was never before fo practicable; as the feed may now be put in with the utmoft degree of regularity, in both methods of culture, by the fame machine;

Practice. machine; consequently, the seed will be sown in both cases with equal accuracy, without which it is impossible to make a just decision.

The excellence of this machine consists in spreading any given quantity of seed over any given number of acres, with a mathematical exactness, which cannot be done by hand; by which a great saving may be made in seeding the ground, as well as benefiting the expected crop.

There has always been a difficulty in sowing turnip seed with any degree of exactness, both from the minuteness of the seed, and the smallness of the quantity required to be sown on an acre. Here the machine has a manifest advantage, as it may be set to sow the least quantity ever required on an acre; and with an accuracy the best seedsman can never attain to.

It will also sow clover, cole, flax, and every other kind of small seed, with the utmost degree of regularity.

It will likewise broad-cast beans, pease, and tares, or drill them with the greatest exactness, particularly when constructed to be used with a plough.

Another advantage attending the use of this machine is, that the wind can have no effect on the falling of the seed.

Of the Machine when made to be used without a Plough, and to be drawn by a Horse.—It may in
Fig. 2. this case be made of different lengths at the desire of the purchaser. The upper part AAAA, contains the hoppers from which the grain or seed descends into the spouts. The several spouts all rest upon a bar, which hangs and plays freely by two diagonal supporters BB; a trigger fixed to this bar bears a catch wheel: this being fixed on the axle, occasions a regular and continual motion, or jogging of the spouts, quicker or slower in proportion to the pace the person sowing with it drives; and of course, if he quickens his pace, the bar will receive a greater number of strokes from the catch wheel, and the grain or seed will feed the faster. If he drives slower, by receiving fewer strokes, the contrary must take place. In going along the side of a hill, the strength of the stroke is corrected by a spring which acts with more or less power, in proportion as the machine is more or less from a horizontal position, and counteracts the difference of gravity in the bar, so that it presses, in all situations, with a proper force against the catch wheel. This spring is unnecessary if the land be pretty level. At the bottom of the machine is placed an apron or shelf in a sloping position, and the corn or seed, by falling thereon from the spouts above, is scattered about in every direction under the machine, and covers the ground in a most regular and uniform manner.

To sow the corn or seed in drills, there are moveable spouts, (see fig. 10.) which are fixed on, or taken off at pleasure, to direct the seed from the upper spout to the bottom of the furrow.

The machine is regulated for sowing any particular quantity of seed on an acre by a brass slider, A, fig. 7. fixed by screws against a brass bridge on each of the spouts. The machine is prevented from feeding while turning at the ends, by only removing the lever, E, fig. 2. out of the channel G, to another at H, on the right hand of it, which carries back the bar from the catch-wheel, and occasions the motion of the spouts to cease, and at the same time brings them upon a level by the action of the diagonal supporters; so that no corn or seed can fall from them. Practice.

The machine in this form is particularly useful for broad-casting clover upon barley or wheat; or for sowing any other kind of seed, where it is necessary that the land should first be harrowed exceedingly fine and even.

Manner of using the Machine, when drawn by a Horse.—Place the machine about two feet from the ends of the furrows where you intend it shall begin to sow. Fill the hoppers with seed, and drive it forwards with the outside wheel in the first furrow. When you are at the end of the length, at the opposite side of the field, lift the lever E, fig. 2, into the channel H, and the machine will instantly stop sowing. Drive it on about two feet, and then turn. Fill the hoppers again if necessary; then remove the lever back again into the channel G, and in returning, let the outside wheel of the machine go one furrow within the track which was made by it, in passing from the opposite end; as for example, if the wheel passed down the eighth furrow from the outside of the field, let it return in the seventh; and in every following length let the outside wheel always run one furrow within the tract made by the same wheel: because the breadth sown is about nine inches less than the distance between the wheels.

Let the machine be kept in a perpendicular situation. If the farmer wishes to sow more or less seed on any one part of the field than the other, it is only raising the handles a little higher, or sinking them a little lower than usual, and it will occasion a sufficient alteration; and should the last turn be less in breadth than the machine, those spouts which are not wanted may be taken up from the bar, and prevented from feeding, by turning the knob above them.

Also, when the land required to be sown has what is called a *vent*, that is, when the sides of the field run in an oblique line to the furrows, which by this means are unequal in length; the spouts must be taken up or let down in succession by turning the knobs; as that part of the machine, where they are placed, arrives at the ends of the furrows. This is done while the machine is going forwards.

If the land be tolerably level, the machine may be fixed by the screw in the front, and the machine may then be used by any common harrow boy.

Method of regulating the Machine.—In each spout is fixed a bridge, (see fig. 7.) with an aperture in it, B, for the grain or seed to pass through. This aperture is enlarged or contracted by a slider, A, which passes over it; and when properly fixed for the quantity of seed designed to be sown on an acre, is fastened by means of two strong screws firmly against the bridge. This is made use of in sowing all kinds of seed, where it is required to sow from one bushel upwards on an acre. To sow one, two, three gallons, or any of the intermediate quantities, as of clover, cole-seed, &c. the brass plate, fig. 6, is placed between the bridge and the slider, with the largest aperture B downwards, which aperture is enlarged or contracted by the slider as before. To sow turnips, the same plate is placed between the bridge and the slider, with its smallest aperture A downwards, and the hollow part about the same aperture inwards.

Fig. 8. is a view of the regulator, by which the apertures

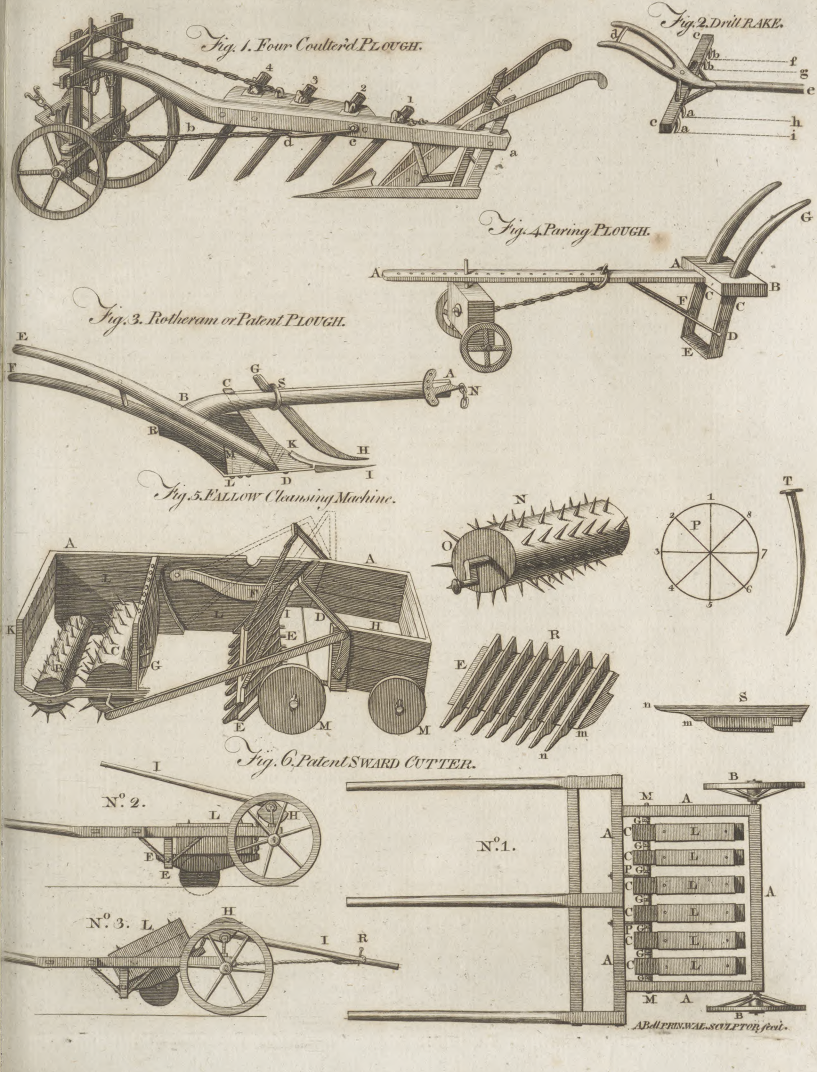
Fig. 1. Four Coulter'd PLOUGH.
Fig. 2. Drill RAKE.
Fig. 3. Rotheram or Patent PLOUGH.
Fig. 4. Paring PLOUGH.
Fig. 5. FALLOW Cleansing Machine.
Fig. 6. Patent SWARD CUTTER.
N°. 1.
N°. 2.
N°. 3.
A.Bell PRIN.WAL. SCULPTOR fecit.

apertures in the feveral fpouts are all fet exactly alike, with the utmoft eafe, to make them feed equally. The extreme height of the largeft aperture is equal to the breadth AB, and the breadth at C is equal to the height of the fmalleft aperture ufed, viz. that for turnips. The fide AC, is divided into 60 equal parts, and on it moves the flider or horfe D; which being placed at any particular degree, according to the quantity of feed required to be fown on an acre, is fixed upon it, by a fcrew on the fide of the flider or horfe. When this is done, the end of the regulator is put through the aperture in the bridge or plate (whichever is intended to be ufed), and the flider againft the bridge in the fpout, raifed by it, till it ftops againft the horfe on the regulator; then the flider is faftened againft the bridge firmly by the two fcrews; care being taken at the fame time that it ftands nearly fquare.

By this means the fpouts (being all fixed in the fame manner) will feed equally.

It is eafy to conceive that the fize of the apertures, and confequently the quantity of feed to be fown on an acre, may be regulated with a far greater accuracy than is required in common practice.

The fpouts may be regulated with the utmoft nicety, in five minutes, to fow each particular feed, for the whole feafon. But a little practice will enable any perfon, who poffeffes but a very moderate capacity, to make the fpouts feed equally, even without ufing the regulator (A).

Of the Machine, when made to be ufed by Hand.— The difference of the machine in this cafe is, that it is made lighter, with but three fpouts, without fhafts, and is driven forwards by the handles. It hath alfo a bolt in front, which being pufhed in by the thumb, releafes the machine; fo that it can then eafily be placed in a perpendicular pofition. This alteration is neceffary to keep the handles of a convenient height, in fowing up and down a hill, where the flope is confiderable; and is done while the machine is turning at the end of the length. The method of regulating and ufing it is the fame as when made to be drawn by a horfe.

Of the Machine, when conftructed to be ufed with a Plough.—This is, without doubt, the moft ufeful application of the machine; and it can be fixed without difficulty to any kind of plough, in the fame manner as to that reprefented in fig. 1.

The advantages arifing from the ufe of it are great and numerous; for, befide the increafe in the crop, which will be infured by the feeds being broad-caft with a mathematical nicety, a large proportion of feed (the value of which alone, in a few months, will amount to more than the price of the machine) and the feedfman's labour will be faved. The feed may likewife be fown either under or over furrow; or one caft each way, as is practifed by fome farmers. The feed alfo, being caft by the machine upon the frefh ploughed land, may be immediately harrowed in, before the mould has loft any part of its moifture; which in a dry feafon will greatly promote the crop. In drilling any kind of grain, pulfe, or feed, it poffeffes every property that can be wifhed for in the beft drill-plough, nor will it (as moft of them do) bruife the feed, or feed irregularly. The conftruction of the machine is the fame as the large ones, except being made with one hopper and fpout inftead of feveral, and the apron moveable inftead of being fixed, as may be feen by infpecting fig. 4. The only alteration neceffary to make the machine broad-caft or drill is, in the former cafe to place the apron B, fig. 1, at the bottom of the machine, upon the hooks FF, floping either towards the furrows or the imploughed land, according as it is intended to fow the feed, either over or under furrow. Whenever the apron is required to be fhifted, it is done in lefs than a fecond of time; as it only requires to be moved up or down with the hand, when a catch fixes it.

To prepare it for drilling, inftead of the apron, place the long fpout, fig. 10, upon the brackets, on the front of the machine, by the ears AA, to receive the feed from the upper fpout, and faften the lower end of it, by a fmall cord, to that hook upon which the apron is hung for broad-cafting, which is next the plough (fee fig. 3;) the feed will then be directed by the long fpout, to the centre of the furrow, near the heel of the plough. The fpring for correcting the ftrength of the ftroke, is neceffary only when they are required to go along the fide of a confiderable declivity. The machine, when fixed to a plough, does not require the fmalleft degree of fkill in ufing, as nothing is neceffary but to keep the hopper filled, which will contain a fufficient quantity of feed to go upwards of 140 rods, before it will want re-filling, when three bufhels and a half are fown on an acre. The accuracy with which it will broad-caft, may in fome meafure be conceived, by confidering that the feed regularly defcends upon the apron or fhelf, and is from thence fcattered upon the ground, in quantity exactly proportioned to the fpeed of the plough: alfo that each caft fpreads to the third furrow; and by this means fhuts upon the laft. In this manner it is continually filling up till the whole field is completely covered; fo that it is impoffible to leave the fmalleft fpace without its proper quantity of feed.

When the plough is wanted for any other purpofe, the

(A) Proper directions are given with each machine for ufing it, as alfo for fixing the fliders to fow any particular quantity of corn or feed on an acre, fo as to enable any perfon to fet the fpouts.

The prices of the machine (exclufive of the packing cafes) are as follow. If conftructed to be ufed with a fingle furrow plough; the wheel, with the axle and cheeks fteeled, ftrap, regulator, brafs-plates for broad-cafting or drilling turnips, lucerne, tares, wheat, barley, &c. &c. &c. and every article neceffary for fixing it included, three guineas and a half. If made with a fpring (for fowing on the fide of a hill, where the flope is confiderable), but which is very rarely neceffary, five fhillings more. If made to be fixed to any double-furrow plough, four guineas and a half.

The large machine, fig. 2. when made to broad-coaft feven furrows at a time and to be drawn by a horfe, eight guineas and a half. If conftructed to fow five furrows at a time, and to be ufed by hand, fix guineas. Thefe are alfo five fhillings more if made with a fpring.

Practice. the machine, with the wheel at the heel of the plough for giving it motion, can be removed or replaced at any time in five minutes.

Fig. 11. reprefents the machine fixed to a double-furrow creafing plough, and prepared for drilling. As this plough may not be generally known, it will not be improper to obferve, that it is chiefly ufed for creafing the land with furrows (after it has been once ploughed and harrowed); which method is neceffary when the feed is to be fown broad-caft upon land that has been a clover-lay, &c. becaufe, if the feed be thrown upon the rough furrows, a confiderable part of it will fall between them, and be unavoidably loft, by laying too deep buried in the earth. This mode anfwers extremely well, and partakes of both methods of culture; the feed, though fown broad-caft, falling chiefly into the furrows.

The machine is very ufeful for fowing in this manner; as the feed is broad-caft, with an inconceivable regularity, at the time the land is creafed. The advantages it likewife poffeffes for drilling all forts of grain or feed with this plough, are too evident to need mentioning.

The machine, when conftructed to be ufed with a double-furrow plough, is made with two upper and two long fpouts for drilling, two aprons for broad-cafting, and with a double hopper; but in other refpects the fame as when intended for a fingle furrow plough: it is ufed in all cafes with the greateft eafe imaginable.

The interval between the points of the two fhares of a creafing plough is ufually ten inches; the beam about nine feet long; and the whole made of a light conftruction.

2d Plate VII *A more particular explanation of the figures.*—Fig. 1. The machine fixed to a Kentifh turn wreft plough. A, The machine. B, The apron upon which the feed falls and rebounds upon the land, in broad-cafting. C, Lid to cover the hopper. D, Wheel at the heel of the plough. E, ftrap. FF, Hooks, upon which the apron turns by a pivot on each fide. G, Stay, to keep the machine fteady. H, Lever, to prevent it from fowing.

Fig. 2. The machine conftructed to be drawn by a horfe. AAAA, The hoppers. BB, The diagonal fupporters. CCCC, The upper fpouts. D, The apron or fhelf upon which the feed falls from the upper fpouts. E, The lever, which carries back the bar, and prevents the machine from fowing. FF, Staples upon the handles, through which the reins pafs, for the man who conducts the machine, to direct the horfe by. I, Screw, to fix the machine occafionally. N. B. The knobs (by turning which each particular fpout may be taken from off the bar, and thereby prevented from feeding) are over each upper fpout; but, to prevent confufion, are not lettered in the Plate.

Fig. 3. Is the fame machine with that in fig. 1. The dotted lines, expreffing the fituation of the long fpout, when the apron is removed, and the machine adapted for drilling,

Fig. 4. Alfo the fame machine, with the front laid open to fhow the infide. A, The catch-wheel fixed upon the axle. BB, The axle upon which the machine hangs between the handles of the plough. C, The pulley, by which the ftrap from the wheel at the heel of the plough turns the catch-wheel. D, The bar, upon which the upper fpout refts, fufpended by the diagonal fupporters EE, bearing againft the catch-wheel by the trigger F, and thereby kept in motion while the plough is going. G, The apron in a floping pofition, upon which the corn or feed falls from the upper fpout, and is fcattered by rebounding upon the land. It turns upon pivots, and by this means throws the feed either towards the right hand or left at pleafure.

Fig. 5. The upper fpout.

Fig. 6. The plate which is placed between the bridge and the flider, for fowing fmall feeds. The aperture A being downwards for fowing turnips; the larger one B downwards for fowing clover, &c.

Fig. 7. The bridge, fixed in the upper fpouts. A, The flider, which contracts or enlarges the different apertures. B, The aperture in the bridge, through which the feed paffes, when fowing any quantity from one bufhel upwards on an acre.

Fig. 8. The regulator, made of brafs. D, The flider or horfe which moves upon it, and is fixed at any particular degree by a fcrew in its fide.

Fig. 9. Reprefents the movement in the machine fig. 2. AAAA, Cleets, between which the upper fpouts reft. BB, The diagonal fupporters, by which the bar with the upper fpouts hang. C, The catch-wheel. DD, The axle. E, The trigger upon the bar, which bears againft the catch-wheel. FF, Stays from the back of the machine, by which the bar plays.

Fig. 10, The long fpout. AA, The ears by which it hangs.

SECT. II. *Preparing Land for Cropping.*

1. OBSTRUCTIONS to CROPPING.

In preparing land for cropping, the firft thing that occurs, is to confider the obftructions to regular ploughing. The moft formidable of thefe, are *ftones* lying above or below the furface, which are an impediment to a plough, as rocks are to a fhip. Stones above the furface may be avoided by the ploughman, though not without lofs of ground; but ftones below the furface are commonly not difcovered till the plough be fhattered to pieces, and perhaps a day's work loft. The clearing land of ftones is therefore neceffary to prevent mifchief. And to encourage the operation, it is attended with much actual profit. In the firft place, the ftones are ufeful for fences: when large they muft be blown, and commonly fall into parts proper for building. And as the blowing, when gunpowder is furnifhed, does not exceed a halfpenny for each inch that is bored, thefe ftones come generally cheaper than to dig as many out of the quarry. In the next place, as the foil round a large ftone is commonly the beft in the field, it is purchafed at a low rate by taking out the ftone. Nor is this a trifle; for not only is the ground loft that is occupied by a large ftone, but alfo a confiderable fpace round it, to which the plough has not accefs without danger. A third advantage is greater than all the reft; which is, that the ploughing can be carried on with much expedition, when there is no apprehenfion of ftones: in ftony land, the plough muft proceed fo flow, as not to perform half of its work.

106 Obftructions, *viz.* 107 Stones.

To clear land of ftones, is in many inftances an undertaking

dertaking too expensive for a tenant who has not a very long leafe. As it is profitable both to him and to his landlord, it appears reafonable that the work fhould be divided, where the leafe exceeds not nineteen years. It falls naturally upon the landlord to be at the expence of blowing the ftones, and upon the tenant to carry them off the field.

108 Wetnefs. Another obftruction is *wet ground*. Water may improve gravelly or fandy foils; but it fours (A) a clay foil, and converts low ground into a morafs, unfit for any purpofe that can intereft the hufbandman.

A great deal has been written upon different methods of draining land, moftly fo expenfive as to be fcarce fit for the landlord, not to mention the tenant.

One way of draining without expence when land is to be inclofed with hedge and ditch, is to direct the ditches fo as to carry off the water. But this method is not always practicable, even where the divifions lie convenient for it. If the run of water be confiderable, it will deftroy the ditches, and lay open the fences, efpecially where the foil is loofe or fandy.

If ditches will not anfwer, hollow drains are fometimes made, and fometimes open drains, which muft be made fo deep as to command the water. The former is filled up with loofe ftones, with brufh-wood, or with any other porous matter that permits the water to pafs. The latter is left open, and not filled up. To make the former effectual, the ground muft have fuch a flope as to give the water a brifk courfe. To execute them in level ground is a grofs error: the paffages are foon ftopped up with fand and fediment, and the work is rendered ufelefs. This inconvenience takes not place in open drains; but they are fubject to other inconveniences: They are always filling up, to make a yearly reparation neceffary; and they obftruct both ploughing and pafturing.

The following is the beft in all views. It is an open drain made with the plough, cleaving the fpace intended for the drain over and over, till the furrow be made of a fufficient depth for carrying off the water. The flope on either fide may, by repeated ploughings, be made fo gentle as to give no obftruction either to the plough or to the harrow. There is no occafion for a fpade, unlefs to fmooth the fides of the drain, and to remove accidental obftructions in the bottom. The advantages of this drain are manifold. It is executed at much lefs expence than either of the former; and it is perpetual, as it can never be obftructed. In level ground, it is true, grafs may grow at the bottom of the drain; but to clear off the grafs once in four or five years, will reftore it to its original perfection. A hollow drain may be proper between the fpring-head and the main drain, where the diftance is not great; but in every other cafe the drain recommended is the beft.

Where a level field is infefted with water from higher ground, the water ought to be intercepted by a ditch carried along the foot of the high ground, and terminating in fome capital drain.

The only way to clear a field of water that is hollow in the middle, is to carry it off by fome drain ftill lower. This is commonly the cafe of a morafs fed with water from higher ground, and kept on the furface by a clay bottom.

A clay foil of any thicknefs is never peftered with fprings; but it is peftered with rain, which fettles on the furface as in a cup. The only remedy is high narrow ridges, well rounded. And to clear the furrows, the furrow of the foot-ridge ought to be confiderably lower, in order to carry off the water cleverly. It cannot be made too low, as nothing hurts clay foil more than the ftagnation of water on it; witnefs the hollows at the end of crooked ridges, which are abfolutely barren. Some gravelly foils have a clay bottom; which is a fubftantial benefit to a field when in grafs, as it retains moifture. But when in tillage, ridges are neceffary to prevent rain from fettling at the bottom; and this is the only cafe where a gravelly foil ought to be ridged.

Clay foils that have little or no level, have fometimes a gravelly bottom. For difcharging the water, the beft method is, at the end of every ridge to pierce down to the gravel, which will abforb the water. But if the furrow of the foot-ridge be low enough to receive all the water, it will be more expeditious to make a few holes in that furrow. In fome cafes, a field may be drained, by filling up the hollows with earth taken from higher ground. But as this method is expenfive, it will only be taken where no other method anfwers. Where a field happens to be partly wet, partly dry, there ought to be a feparation by a middle ridge, if it can be done conveniently; and the dry part may be ploughed while the other is drying.

The low part of Berwickfhire is generally a brick clay, extremely wet and poachy during winter. This in a good meafure may be prevented by proper inclofing, as there is not a field but can be drained into lower ground all the way down to the river Tweed. But as this would leffen the quantity of rain in a dry climate, fuch as is all the eaft fide of Britain, it may admit of fome doubt whether the remedy would not be as bad as the difeafe. (*See the article* DRAINING.)

2. Bringing into CULTURE, LAND from the STATE of NATURE.

To improve a moor, let it be opened in winter when it is wet; which has one convenience, that the plough cannot be employed at any other work. In fpring, after froft is over, a flight harrowing will fill up the feams with mould, to keep out the air, and rot the fod. In that ftate let it lie the following fummer and winter, which will rot the fod more than if laid open to the air by ploughing. Next April, let it be crofs-ploughed, braked, and harrowed, till it be fufficiently pulverized. Let the manure laid upon it, whether lime or dung, be intimately mixed with the foil by repeated harrowings. This will make a fine bed for turnip-feed if fown broad-caft. But if drills be intended, the method muft 109 Moorifh ground.

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(A) By this expreffion it is not meant that the ground really becomes acid, but only that it becomes unfit for the purpofes of vegetation. The natural products of fuch a foil are rufhes and *four grafs:* which laft appears in the furrows, but feldom in the crown of the ridge; is dry and taftelefs like a chip of wood; and feels rough when ftroked backwards.

Practice. be followed that is directed afterward in treating more directly of the culture of turnip.

A succesful turnip-crop, fed on the ground with sheep, is a fine preparation for laying down a field with grass-seeds. It is an improvement upon this method, to take two or three successive crops of turnip, which will require no dung for the second and following crops. This will thicken the soil, and enrich it greatly.

110 Swampy ground.

The best way of improving swampy ground after draining, is paring and burning. But where the ground is dry, and the soil so thin as that the surface cannot be pared, the best way of bringing it into tilth from the state of nature, as mentioned above, is to plough it with a feathered sock, laying the grassy surface under. After the new surface is mellowed with frost, fill up all the seams by harrowing cross the field, which by excluding the air will effectually rot the sod. In this state let it lie summer and winter. In the beginning of May after, a cross-ploughing will reduce all to small square pieces, which must be pulverized with the brake, and make it ready for a May or June crop. If these square pieces be allowed to lie long in the sap without breaking, they will become tough and not be easily reduced.

3. Forming Ridges.

111 Of ridges.

The first thing that occurs on this head, is to consider what grounds ought to be formed into ridges, and what ought to be tilled with a flat surface. Dry soils, which suffer by lack of moisture, ought to be tilled flat, which tends to retain moisture. And the method for such tilling, is to go round and round from the circumference to the centre, or from the centre to the circumference. This method is advantageous in point of expedition, as the whole is finished without once turning the plough. At the same time, every inch of the soil is moved, instead of leaving either the crown or the furrow unmoved, as is commonly done in tilling ridges. Clay soil, which suffers by water standing on it, ought to be laid as dry as possible by proper ridges. A loamy soil is the middle between the two mentioned. It ought to be tilled flat in a dry country, especially if it incline to the soil first mentioned. In a moist country, it ought to be formed into ridges, high or low according to the degree of moisture and tendency to clay.

In grounds that require ridging, an error prevails, that ridges cannot be raised too high. High ridges labour under several disadvantages. The soil is heaped upon the crown, leaving the furrows bare: the crown is too dry, and the furrows too wet: the crop, which is always best on the crown, is more readily shaken with the wind, than where the whole crop is of an equal height: the half of the ridge is always covered from the sun, a disadvantage which is far from being slight in a cold climate. High ridges labour under another disadvantage in ground that has no more level than barely sufficient to carry off water: they sink the furrows below the level of the ground; and consequently retain water at the end of every ridge. The furrows ought never to be sunk below the level of the ground. Water will more effectually be carried off by lessening the ridges both in height and breadth: a narrow ridge, the crown of which is but 18 inches higher than the furrow, has a greater slope than a very broad ridge where the difference is three or four feet.

Next, of forming ridges where the ground hangs considerably. Ridges may be too steep as well as too horizontal; and if to the ridges be given all the steepness of a field, a heavy shower may do irreparable mischief. To prevent such mischief, the ridges ought to be so directed cross the field, as to have a gentle slope for carrying off water slowly, and no more. In that respect, a hanging field has greatly the advantage of one that is nearly horizontal; because in the latter, there is no opportunity of a choice in forming the ridges. A hill is of all the best adapted for directing the ridges properly. If the soil be gravelly, it may be ploughed round and round, beginning at the bottom and ascending gradually to the top in a spiral line. This method of ploughing a hill, requires no more force than ploughing on a level; and at the same time removes the great inconvenience of a gravelly hill, that rains go off too quickly; for the rain is retained in every furrow. If the soil be such as to require ridges, they may be directed to any slope that is proper.

In order to form a field into ridges, that has not been formerly cultivated, the rules mentioned are easily put in execution. But what if ridges be already formed, that are either crooked or too high? After seeing the advantage of forming a field into ridges, people were naturally led into an error, that the higher the better. But what could tempt them to make their ridges crooked? Certainly this method did not originate from design; but from the laziness of the driver suffering the cattle to turn too hastily, instead of making them finish the ridge without turning. There is more than one disadvantage in this slovenly practice. First, the water is kept in by the curve at the end of every ridge, and sours the ground. Next, as a plough has the least friction possible in a straight line, the friction must be increased in a curve, the back part of the mouldboard pressing hard on the one hand, and the coulter pressing hard on the other. In the third place, the plough moving in a straight line, has the greatest command in laying the earth over. But where the straight line of the plough is applied to the curvature of a ridge in order to heighten it by gathering, the earth moved by the plough is continually falling back, in spite of the most skilful ploughman.

The inconveniences of ridges high and crooked are so many, that one would be tempted to apply a remedy at any risk. And yet, if the soil be clay, it would not be advisable for a tenant to apply the remedy upon a lease shorter than two nineteen years. In a dry gravelly soil, the work is not difficult nor hazardous. When the ridges are cleaved two or three years successively in the course of cropping, the operation ought to be concluded in one summer. The earth, by reiterated ploughings, should be accumulated upon the furrows, so as to raise them higher than the crowns: they cannot be raised too high, for the accumulated earth will subside by its own weight. Cross-ploughing once or twice, will reduce the ground to a flat surface, and give opportunity to form ridges at will. The same method brings down ridges in clay soil: only let care be taken to carry on the work with expedition; because

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cause a hearty shower, before the new ridges are formed, would soak the ground in water, and make the farmer suspend his work for the remainder of that year at least. In a strong clay, we would not venture to alter the ridges, unless it can be done to perfection in one season.—On this subject Mr Anderson has the following observations*.

* *Essays on Agriculture*, Vol. I. p. 146

112 Inconveniences in the common methods of levelling.

"The difficulty of performing this operation properly with the common implements of husbandry, and the obvious benefit that accrues to the farmer from having his fields level, has produced many new inventions of ploughs, harrows, drags, &c. calculated for speedily reducing the fields to that state; none of which have as yet been found fully to answer the purpose for which they were intended, as they all indiscriminately carry the earth that was on the high places into those that were lower; which, although it may, in some cases, render the surface of the ground tolerably smooth and level, is usually attended with inconveniences far greater, for a considerable length of time, than that which it was intended to remove.

113 Vegetable mould becomes inert by being long buried.

"For experience sufficiently shows, that even the best vegetable mould, if buried for any length of time so far beneath the surface as to be deprived of the benign influences of the atmosphere, loses its *vis vitæ*, if I may be allowed that expression; becomes an inert, lifeless mass, little fitted for nourishing vegetables; and constitutes a soil very improper for the purposes of the farmer. It therefore behoves him, as much as in him lies, to preserve, on every part of his fields, an equal covering of that vegetable mould that has long been uppermost, and rendered fertile by the meliorating influence of the atmosphere. But, if he suddenly levels his high ridges by any of these mechanical contrivances, he of necessity buries all the good mould that was on the top of the ridges in the old furrows; by which he greatly impoverishes one part of his field, while he too much enriches another; insomuch that it is a matter of great difficulty, for many years thereafter, to get the field brought to an equal degree of fertility in different places; which makes it impossible for the farmer to get an equal crop over the whole of his field by any management whatever: and he has the mortification frequently, by this means, to see the one half of his crop rotted by an over-luxuriance, while other parts of it are weak and sickly, or one part ripe and ready for reaping, while the other is not properly filled; so that it were, on many occasions, better for him to have his whole field reduced at once to the same degree of poorness as the poorest of it, than have it in this state. An almost impracticable degree of attention in spreading the manures may indeed in some measure get the better of this; but it is so difficult to perform this properly, that I have frequently seen fields that had been thus levelled, in which, after thirty years of continued culture and repeated dressings, the marks of the old ridges could be distinctly traced when the corn was growing, altho' the surface was so level that no traces of them could be perceived when the corn was off the ground.

"But this is a degree of perfection in levelling that cannot be usually attained by following this mode of practice; and, therefore, is but seldom seen. For all that can be expected to be done by any levelling machine, is to render the surface perfectly smooth and even in every part, at the time that the operation is performed: but as, in this case, the old hollows are suddenly filled up with loose mould to a great depth, while the earth below the surface upon the heights of the old ridges remain firm and compact, the new-raised earth after a short times subsides very much, while the other parts of the field do not sink at all; so that in a short time the old furrows come to be again below the level of the other parts of the field, and the water of course is suffered in some degree to stagnate upon them; in so much that, in a few years, it becomes necessary once more to repeat the same levelling process, and thus renew the damage that the farmer sustains by this pernicious operation.

114 Levelling sometimes not to be attempted.

"On these accounts, if the farmer has not a long lease, it will be found in general to be much his interest to leave the ridges as he found them, rather than to attempt to alter their direction: and, if he attends with due caution to moderate the height of these old ridges, he may reap very good crops, although perhaps at a somewhat greater expence of labour than he would have been put to upon the same field, if it had been reduced to a proper level surface, and divided into straight and parallel ridges.

"But, where a man is secure of possessing his ground for any considerable length of time, the advantages that he will reap from having level and well laid-out fields, are so considerable as to be worth purchasing, if it should even be at a considerable expence. But the loss that is sustained at the beginning, by this mechanical mode of levelling ridges, if they are of considerable height, is so very great, that it is perhaps doubtful if any future advantages can ever fully compensate it. I would therefore advise, that all this levelling apparatus should be laid aside; and the following more efficacious practice be substituted in its stead: A practice that I have long followed with success, and can safely recommend as the very best that has yet come to my knowledge.

115 Best method of levelling.

"If the ridges have been raised to a very great height, as a preparation for the ensuing operations, they may be first *cloven*, or *scaled* out, as it is called in different places; that is, ploughed so as to lay the earth on each ridge from the middle towards the furrows. But, if they are only of a moderate degree of height, this operation may be omitted. When you mean to proceed to level the ground, let a number of men be collected, with spades, more or fewer as the nature of the ground requires, and then set a plough to draw a furrow directly across the ridges of the whole field intended to be levelled. Divide this line into as many parts as you have labourers, allotting to each one ridge or two, or more or less, according to their number, height, and other circumstances. Let each of the labourers have orders, as soon as the plough has passed that part assigned him, to begin to dig in the bottom of the furrow that the plough has just made, about the middle of the side of the old ridge, keeping his face towards the old furrow, working backwards till he comes to the height of the ridge, and then turn towards the other furrow, and repeat the same on the other side of the ridge, always throwing the earth that he digs up into the deep old furrow between the ridges,

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ges, that is directly before him; taking care not to dig deep where he first begins, but to go deeper and deeper as he advances to the height of the ridge, so as to leave the bottom of the trench he thus makes across the ridge entirely level, or as nearly so as possible. And when he has finished that part of the furrow allotted to him that the plough has made in going, let him then go and finish in the same manner his own portion of the furrow that the plough makes in returning. In this manner, each man performs his own task through the whole field, gradually raising the old furrows as the old heights are depressed. And, if an attentive overseer is at hand, to see that the whole is equally well done, and that each furrow is raised to a greater height than the middle of the old ridges, so as to allow for the subsiding of that loose earth, the operation will be entirely finished at once, and never again need to be repeated.

"In performing this operation, it will always be proper to make the ridges, formed for the purpose of levelling, which go across the old ridges, as broad as possible; because the deep trench that is thus made in each of the furrows are an impediment in the future operations, as well as the height that is accumulated in the middle of each of these ridges; so that the fewer there are of these, the better it is. The farmer, therefore, will do well to advert to this in time, and begin by forming a ridge by always turning the plough to the right hand, till it becomes of such a breadth as makes it very inconvenient to turn longer in that manner; and then, at the distance of twice the breadth of this new-formed ridge from the middle of it, mark off a furrow for the middle of another ridge, turning round it to the right hand, in the same manner as was done in the former, till it becomes of the same breadth with it; and then, turning to the left hand, plough out the interval that was left between the two new-formed ridges. By this mode of ploughing, each ridge may be made of 40, or 50 or 60 yards in breadth, without any great inconvenience; for although some time will be lost in turning at the ends of these broad ridges, yet, as this operation is only to be once performed in this manner, the advantage that is reaped by having few open furrows, is more than sufficient to counterbalance it. And, in order to moderate the height that would be formed in the middle of each of these great ridges, it will always be proper to mark out the ridges, and draw the furrow that is to be the middle of each some days before you collect your labourers to level the field; that you may, without any hurry or loss of labour, clear out a good trench through the middle of each of the old ridges; as the plough at this time going and returning nearly in the same track, prevents the labourers from working properly without this precaution.

"If these rules are attended to, your field will be at once reduced to a proper level, and the rich earth that formed the surface of the old ridges be still kept upon the surface of your field; so that the only loss that the possessor of such ground can sustain by this operation, is merely the expence of performing it."

He afterwards makes a calculation of the different expences of levelling by the plough and by the spade, in which he finds the latter by far the cheapest method.

116 Proper direction of the ridges.

Let it be a rule, to direct the ridges north and south, if the ground will permit. In this direction, the east and west sides of the ridges, dividing the sun equally between them, will ripen at the same time.

117 Narrow ridges an advantage.

It is a great advantage in agriculture, to form ridges so narrow, and so low, as to admit the crowns and furrows to be changed alternately every crop. The soil nearest the surface is the best; and by such ploughing, it is always kept near the surface, and never buried. In high ridges, the soil is accumulated at the crown and the furrows left bare. Such alteration of crown and furrow, is easy where the ridges are no more but seven or eight feet broad. This mode of ploughing answers perfectly well in sandy and gravelly soils, and even in loam; but it is not safe in clay soil. In that soil, the ridges ought to be 12 feet wide, and 20 inches high; to be preserved always in the same form by casting, that is, by ploughing two ridges together, beginning at the furrow that separates them, and ploughing round and round till the two ridges be finished. By this method, the separating furrow is raised a little higher than the furrows that bound the two ridges. But at the next ploughing, that inequality is corrected, by beginning at the bounding furrows, and going round and round till the ploughing of the two ridges be completed at the separating furrow.

4. Clearing Ground of Weeds.

118 Cleaning harrow. Plate V. fig. 6.

For this purpose a new instrument, termed a *cleaning harrow*, has been introduced by Lord Kames, and is strongly recommended (B). It is one entire piece like the first of those mentioned above, consisting of seven bulls, four feet long each, two and one-fourth inches broad, two and three-fourths deep. The bulls are united together by sheths, similar to what are mentioned above. The intervals between the bulls being three and three-fourths inches, the breadth of the whole harrow is three feet five inches. In each bull are inserted eight teeth, each nine inches free below the wood, and distant from each other six inches. The weight of each tooth is a pound, or near it. The whole is firmly bound by an iron plate from corner to corner in the line of the draught. The rest as in the harrows mentioned above. The size, however, is not invariable. The cleaning harrow ought to be larger or less according as the soil is stiff or free.

To give this instrument its full effect, stones of such a size as not to pass freely between the teeth ought to be carried off, and clods of that size ought to be broken. The ground ought to be dry, which it commonly is in the month of May.

In preparing for barley, turnip, or other summer-crop, begin with ploughing and cross-ploughing. If the ground be not sufficiently pulverized, let the great brake be applied, to be followed successively with the 1st and 2d harrows. In stiff soil, rolling may be proper, Plate V. fig. 3, 4.
or twice between the acts. These operations will loosen every root, and bring some of them to the surface.

This

(B) In his *Gentleman Farmer*; to which performance the practical part of this article is materially indebted.

Practice. Fig. 5.

This is the time for the 3d harrow, conducted by a boy mounted on one of the horses, who trots smartly along the field, and brings all the roots to the surface: there they are to lie for a day or two, till perfectly dry. If any stones or clods remain, they must be carried off in a cart. And now succeeds the operation of the cleaning harrow. It is drawn by a single horse, directed by reins, which the man at the opposite corner puts over his head, in order to have both hands free. In this corner is fixed a rope, with which the man from time to time raises the harrow from the ground, to let the weeds drop. For the sake of expedition, the weeds ought to be dropt in a straight line cross the field, whether the harrow be full or not; and seldom is a field so dirty but that the harrow may go 30 yards before the teeth are filled. The weeds will be thus laid in parallel rows, like those of hay raked together for drying. A harrow may be drawn swiftly along the rows, in order to shake out all the dust; and then the weeds may be carried clean off the field in carts. But we are not yet done with these weeds: instead of burning, which is the ordinary practice, they may be converted into useful manure, by laying them in a heap with a mixture of hot dung to begin fermentation. At first view, this way of cleaning land will appear operose; but upon trial, neither the labour nor expence will be found immoderate. At any rate, the labour and expence ought not to be grudged; for if a field be once thoroughly cleaned, the seasons must be very cross, or the farmer very indolent, to make it necessary to renew the operation in less than 20 years. In the worst seasons, a few years pasture is always under command; which effectually destroys triennial plants, such as thistles and couch-grass.

5. On the Nature of different kinds of Soils, and the Plants proper to each.

1. Clay, which is in general the stiffest of all soils, and contains an unctuous quality. But under the term *clays*, earths of different sorts and colours are included. One kind is so obstinate, that scarcely any thing will subdue it; another is so hungry and poor, that it absorbs whatever is applied, and turns it into its own quality. Some clays are fatter than others, and the fattest are the best; some are more soft and slippery. But all of them retain water poured on their surfaces, where it stagnates, and chills the plants, without sinking into the soil. The closeness of clay prevents the roots and fibres of plants from spreading in search of nourishment. The blue, the red, and the white clay, if strong, are unfavourable to vegetation. The stony and looser sort are less so; but none of them are worth any thing till their texture is so loosened by a mixture of other substances, and opened, as to admit the influence of the sun, the air, and frosts. Among the manures recommended for clay, sand is of all others to be preferred; and sea-sand the best of all where it can be obtained: This most effectually breaks the cohesion.

The reason for preferring sea-sand is, that it is not formed wholly (as most other sands are) of small stones; but contains a great deal of calcareous matter in it, such as, shells grated and broken to pieces by the tide; and also of salts. The smaller the sand is the more easily it penetrates the clay; but it abides less time in it than the larger.

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The next best sand is that washed down by rains on gravelly soils. Those which are dry and light are the worst. Small gritty gravel has also been recommended by the best writers on agriculture for these soils; and in many instances we have found them to answer the purpose.

Shell marle, ashes, and all animal and vegetable substances, are very good manures for clay; but they have been found most beneficial when sand is mixed with them. Lime has been often used, but the writer of this section would not recommend it, for he never found any advantage from it singly, when applied to clays.

The crops most suitable for such lands are, wheat, beans, cabbages, and rye-grass. Clover seldom succeeds, nor indeed any plants whose roots require depth, and a wide spread in the earth.

2. Chalk. Chalky soils are generally dry and warm, and if there be a tolerable depth of mould, fruitful; producing great crops of barley, rye, pease, vetches, clover, tresoil, burnet, and particularly saint foin. The latter plant flourishes in a chalky soil better than any other. But if the surface of mould be very thin, this soil requires good manuring with clay, marle, loam, or dung. As these lands are dry, they may be sown earlier than others.

When your barley is three inches high, throw in 10 lb. of clover, or 15 lb. of trefoil, and roll it well. The next summer mow the crop for hay; feed off the aftermath with sheep; and in winter give it a top-dressing of dung. This will produce a crop the second spring, which should be cut for hay. As soon as this crop is carried off, plough up the land, and in the beginning of September sow three bushels of rye per acre, either to feed off with sheep in the spring or to stand for harvest. If you feed it off, sow winter vetches in August or September, and make them into hay the following summer. Then get the land into as fine tilth as possible, and sow it with saint foin, which, with a little manure once in two or three years, will remain and produce good crops for 20 years together.

3. Light poor land, which seldom produces good crops of any thing till well manured. After it is well ploughed, sow three bushels of buck-wheat per acre, in April or May: When in bloom, let your cattle in a few days to eat off the best, and tread the other down; this done, plough in what remains immediately. This will soon ferment and rot in the ground; then lay it fine, and sow three bushels of rye per acre. If this can be got off early enough, sow turnips; if not, winter vetches to cut for hay. Then get it in good tilth and sow turnip-rooted cabbages, in rows three feet apart. This plant seldom fails, if it has sufficient room, and the intervals be well horse-hoed; and you will find it the best spring-feed for sheep when turnips are over.

The horse-hoeing will clean and prepare the land for saint foin; for the sowing of which April is reckoned the best season. The usual way is to sow it broad-cast, four bushels to an acre; but the writer prefers sowing it in drills two feet asunder; for then it may be horse-hoed, and half the seed will be sufficient.

The

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The horse-hoeing will not only clean the crop, but earth up the plants, and render them more luxuriant and lasting.

If you sow it broad-cast, give it a top-dressing in December or January, of rotten dung or ashes, or, which is still better, of both mixed up in compost.

From various trials, it is found that taking only one crop in a year, and feeding the after-growth, is better than to mow it twice. Cut it as soon as it is in full bloom, if the weather will permit. The hay will be the sweeter, and the strength of the plants less impaired, than if it stands till the seed is formed.

4. Light rich land, being the most easy to cultivate to advantage, and capable of bearing most kinds of grain, pulse, and herbage, little need be said upon it. One thing however is very proper to be observed, that such lands are the best adapted to the drill husbandry, especially where machines are used, which require shallow furrows to be made for the reception of the seed. This, if not prone to couch-grass, is the best of all soils for lucerne; which, if sown in two feet drills, and kept clean, will yield an astonishing quantity of the most excellent herbage. But lucerne will never be cultivated to advantage where couch-grass and weeds are very plentiful; nor in the broad-cast method, even where they are not so; because horse-hoeing is essential to the vigorous growth of this plant.

5. Coarse rough land. Plough deep in autumn; when it has lain two weeks, cross-plough it, and let it lie rough through the winter. In March give it another good ploughing; drag, rake, and harrow it well, to get out the rubbish, and sow four bushels of black oats per acre if the soil be wet, and white oats if dry. When about four inches high, roll them well after a shower: This will break the clods; and the fine mould falling among the roots of the plants will promote their growth greatly.

Some sow clover and ray grass among the oats, but this appears to be bad husbandry. If you design it for clover, sow it single, and let a coat of dung be laid on in December. The snow and rain will then dilute its salts and oil, and carry them down among the roots of the plants. This is far better than mixing the crops on such land, for the oats will exhaust the soil so much that the clover will be impoverished. The following summer you will have a good crop of clover, which cut once, and feed the after-growth. In the winter plough it in, and let it lie till February: Then plough and harrow it well; and in March, if the soil be moist, plant beans in drills of three feet, to admit the horse-hoe freely. When you horse-hoe them a second time, sow a row of turnips in each interval, and they will succeed very well. But if the land be strong enough for sowing wheat as soon as the beans are off, the turnips may be omitted.

Sect. III. *Culture of particular Plants.*

119 The articles hitherto insisted on, are all of them preparatory to the capital object of a farm, that of raising plants for the nourishment of man, and of other animals. These are of two kinds; culminferous and leguminous; differing widely from each other. Wheat, rye, barley, oats, rye-grass, are of the first kind: of the other kind are, pease, beans, clover, cabbage, and many others.

120 Culmiferous plants.

Culmiferous plants, says Bonnet, have three sets of roots. The first issue from the seed, and push to the surface an upright stem; another set issue from a knot in that stem; and a third from another knot, nearer the surface. Hence the advantage of laying seed so deep in the ground as to afford space for all the sets.

121 Leguminous plants.

Leguminous plants form their roots differently. Pease, beans, cabbage, have store of small roots, all issuing from the seed, like the undermost set of culmiferous roots; and they have no other roots. A potato and a turnip have bulbous roots. Red clover has a strong tap-root. The difference between culmiferous and leguminous plants with respect to the effects they produce in the soil, will be insisted on afterward, in the section concerning rotation of crops. As the present section is confined to the propagation of plants, it falls naturally to be divided into three articles: first, Plants cultivated for fruit; second, Plants cultivated for roots; third, Plants cultivated for leaves.

I. Plants Cultivated for Fruit.

1. Wheat and Rye.

122 Fallowing for wheat.

Any time from the middle of April to the middle of May, the fallowing for wheat may commence. The moment should be chosen, when the ground, beginning to dry, has yet some remaining softness: in that condition, the soil divides easily by the plough, and falls into small parts. This is an essential article, deserving the strictest attention of the farmer. Ground ploughed too wet, rises, as we say, *whole-fur*, as when pasture-ground is ploughed: where ploughed too dry, it rises in great lumps, which are not reduced by subsequent ploughings; not to mention, that it requires double force to plough ground too dry, and that the plough is often broken to pieces. When the ground is in proper order, the farmer can have no excuse for delaying a single minute. This first course of fallow must, it is true, yield to the barley-seed; but as the barley-seed is commonly over the first week of May, or sooner, the season must be unfavourable if the fallow cannot be reached by the middle of May.

As clay soil requires high ridges, these ought to be cleaved at the first ploughing, beginning at the furrow, and ending at the crown. This ploughing ought to be as deep as the soil will admit: and water-furrowing ought instantly to follow; for if rain happen before water-furrowing, it stagnates in the furrow, necessarily delays the second ploughing till that part of the ridge be dry, and prevents the furrow from being mellowed and roasted by the sun. If this first ploughing be well executed, annual weeds will rise in plenty.

About the first week of June, the great brake will loosen and reduce the soil, encourage a second crop of annuals, and raise to the surface the roots of weeds moved by the plough. Give the weeds time to spring, which may be in two or three weeks. Then proceed to the second ploughing about the beginning of July; which must be cross the ridges, in order to reach all the slips of the former ploughing. By cross-ploughing the furrows will be filled up, and water-furrowing be still more necessary than before. Employ the brake again about the 10th of August, to destroy the annuals that

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As in ploughing a clay soil it is of importance to prevent poaching, the hinting furrows ought to be done with two horses in a line. If four ploughs be employed in the same field, to one of them may be allotted the care of finishing the hinting furrows.

123 Dressing loam for wheat. Loam, being a medium between sand and clay, is of all soils the fittest for culture, and the least subject to chances. It does not hold water like clay; and when wet, it dries sooner. At the same time, it is more retentive than sand of that degree of moisture which promotes vegetation. On the other hand, it is more subject to couch-grass than clay, and to other weeds; to destroy which, fallowing is still more necessary than in clay.

Beginning the fallow about the first of May, or as soon as barley-seed is over, take as deep a furrow as the soil will admit. Where the ridges are so low and narrow as that the crown and furrow can be changed alternately, there is little or no occasion for water furrowing. Where the ridges are so high as to make it proper to cleave them, water-furrowing is proper. The second ploughing may be at the distance of five weeks. Two crops of annuals may be got in the interim, the first by the brake and the next by the harrow; and by the same means eight crops may be got in the season. The ground must be cleared of couch-grass and knot-grass roots, by the cleaning harrow described above. The time for this operation is immediately before the manure is laid on. The ground at that time being in its loosest state, parts with its grass roots more freely than at any other time. After the manure is spread, and incorporated with the soil by brakeing or harrowing, the seed may be sown under furrow, if the ground hang so as easily to carry off the moisture. To leave it rough without harrowing has two advantages: it is not apt to cake with moisture, and the inequalities make a sort of shelter to the young plants against frost. But if it lie flat, it ought to be smoothed with a slight harrow after the seed is sown, which will facilitate the course of the rain from the crown to the furrow.

124 Dressing a sandy soil. A sandy soil is too loose for wheat. The only chance for a crop is after red clover, the roots of which bind the soil; and the instructions above given for loam are applicable here. Rye is a crop much fitter for sandy soil than wheat; and, like wheat, it is generally sown after a summer-fallow.

125 Time for sowing. Lastly, Sow wheat as soon in the month of October as the ground is ready. When sown a month more early, it is too forward in the spring, and apt to be hurt by frost; when sown a month later, it has not time to root before frost comes on, and frost spews it out of the ground.

Setting of wheat, a method which is reckoned one of the greatest improvements in husbandry that has taken place this century. It seems to have been first suggested by planting grains in a garden from mere curiosity, by persons who had no thought or opportunity of extending it to a lucrative purpose. Nor was it attempted on a larger scale, till a little farmer near Norwich began it about 17 years since, upon less than 126 Setting of wheat;
an acre of land. For two or three years only a few followed his example; and these were generally the butt of their neighbours merriment for adopting so singular a practice. They had, however, considerably better corn and larger crops than their neighbours: this, together with the saving in seed, engaged more to follow them: while some ingenious persons, observing its great advantage, recommended and published its utility in the Norwich papers. These recommendations had their effect. The curiosity and inquiry of the Norfolk farmers (particularly round Norwich) were excited, and they found sufficient reason to make general experiments. Among the rest was one of the largest occupiers of lands in this county, who set 57 acres in one year. His success, from the visible superiority of his crop, both in quantity and quality, was so great, that the following autumn he set 300 acres, and has continued the practice ever since. This noble experiment established the practice, 127 A capital improvement in agriculture.
and was the means of introducing it generally among the intelligent farmers in a very large district of land; there being few who now sow any wheat, if they can procure hands to set it. It has been generally observed, that although the set crops appear very thin during the autumn and winter, the plants tiller and spread prodigiously in the spring. The ears are indisputably larger, without any dwarfish or small corn; the grain is of a larger bulk, and specifically heavier per bushel than when sown.

The lands on which this method is particularly prosperous, are either after a clover stubble, or on which trefoil and grass-seed were sown the spring before the 128 Method.
last. These grounds, after the usual manuring, are once turned over by the plough in an extended flag or turf, at ten inches wide; along which a man, who is called a *dibbler*, with two setting-irons, somewhat bigger than ram-rods, but considerably bigger at the lower end, and pointed at the extremity, steps backwards along the turf and makes the holes about four inches asunder every way, and an inch deep. Into these holes the droppers (women, boys, and girls) drop two grains, which is quite sufficient. After this, a gate bushed with thorns is drawn by one horse over the land, and closes up the holes. By this mode, three pecks of grain is sufficient for an acre; and being immediately buried, it is equally removed from vermin or the power of frost. The regularity of its rising gives the best opportunity of keeping it clear from weeds, by weeding or hand-hoeing.

Wheat-setting is a method peculiarly beneficial when corn is dear; and, if the season be favourable, may be practised with great benefit to the farmer. Sir Thomas Beevor of Hethel-Hall in Norfolk, found the produce to be two bushels per acre more than from the wheat which is sown; but having much less small corn intermixed with it, the sample is better, and always fetches a higher price, to the amount generally of two shillings per quarter. 129 Peculiar advantages.

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This method, too, faves to the farmer and to the public fix pecks of feed-wheat in every acre; which, if nationally adopted, would of itfelf afford bread for more than half a million of people.

Add to thefe confiderations, the great fupport given to the poor by this *fecond* harveft, as it may be called, which enables them to difcharge their rents and maintain their families without having recourfe to the parifh.—The expence of fetting by hand is now reduced to about fix fhillings per acre; which, in good weather, may be done by one dibbler, attended by three droppers, in two days. This is five fhillings per day; of which, if the dibbler gives to the children fixpence each, he will have himfelf three fhillings and fixpence for his day's work, which is much more than he can poffibly earn by any other labour fo eafy to himfelf. But put the cafe, that the man has a wife who dibbles with him, and two or three of his own children to drop to him, you fee his gains will then be prodigious, and enough to enfure a plenty of candidates for that work, even in the leaft populous parts of the country.

It is, however, to be obferved with regard to this method, that in feafons when feed-corn is very cheap, or the autumn particularly unfavourable to the practice, it muft certainly be leffened. In light lands, for inftance, a very dry time prevents dibbling; as the holes made with the inftruments will be filled up again by the mould as faft as the inftrument is withdrawn. So, again, in a very wet feafon, on ftrong and ftiff clays, the feeds in the holes cannot be well and properly covered by the bufhes drawn over them. But thefe extremes of dry and wet do not often happen, nor do they affect lands of a moderately confiftent texture, or both light and heavy foils at the fame time, fo that the general practice is in fact never greatly impeded by them.

130 Propagating of wheat by dividing the roots.

Propagating of wheat by dividing and tranfplanting its roots. In the Philofophical Tranfactions for 1768, we meet with a very extraordinary experiment, of which the following is an abftract. On the 2d of June 1766, Mr C. Miller fowed fome grains of the common red wheat; and on the 8th of Auguft a fingle plant was taken up and feparated into 18 parts, and each part planted feparately. Thefe plants having pufhed out feveral fide-fhoots, by about the middle of September fome of them were then taken up and divided, and the reft of them between that time and the middle of October. This fecond divifion produced 67 plants. Thefe plants remained through the winter, and another divifion of them, made between the middle of March and the 12th of April, produced 500 plants. They were then divided no further, but permitted to remain. The plants were in general ftronger than any of the wheat in the fields. Some of them produced upwards of 100 ears from a fingle root. Many of the ears meafured feven inches in length, and contained between 60 and 70 grains.

The whole number of ears which, by the procefs above mentioned, were produced from one grain of wheat, was 21,109, which yielded three pecks and three quarters of clear corn, the weight of which was 47 lb. 7 ounces; and from a calculation made by counting the number of grains in an ounce, the whole number of grains was about 576,840.

By this account we find, that there was only one general divifion of the plants made in the fpring. Had a fecond been made, Mr Miller thinks the number of plants would have amounted to 2000 inftead of 500, and the produce thereby much enlarged.

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The ground was a light blackifh foil, upon a gravelly bottom; and, confequently, a bad foil for wheat. One half of the ground was well dunged, the other half had no manure. There was, however, not any difference difcoverable in the vigour, or growth, or produce, of the plants.

It muft be evident, that the expence and labour of fetting in the above manner by the hand, will render it impracticable upon a large fcale fo as to be productive of any utility. A correfpondent of the Bath Society, therefore (Robert Bogle, Efq; of Daldowin, near Glafgow), with a view to extend the practice, has propofed the ufe of the harrow and roller until fome better implements be invented. This method occurred to him from attending to the practice ufual with farmers on certain occafions, of harrowing their fields after the grain is fprung up. Upon inveftigating the principles upon which thefe practices are founded, he found them confined merely to that of pulverifing the earth, without any attention to Mr Miller's doctrine. They faid, "that after very heavy rains, and then exceffive dry weather, the furface of their lands were apt to be caked, the tender fibres of the young roots were thereby prevented from pufhing, and of courfe the vegetation was greatly obftructed; in fuch inftances, they found very great benefit from harrowing and rolling."

131 Method propofed by Mr Bogle.

Thefe principles he acknowledges to be well founded, fo far as relates to pulverifing; but contends, that the benefit arifing from harrowing and rolling is not derived from pulverizing entirely, but alfo from fubdividing and enabling the plants to tiller (as it is termed). "The harrow (he obferves) certainly breaks the incruftation on the furface, and the roller crumbles the clods; but it is alfo obvious, that the harrow removes a great many of the plants from their original ftations; and that if the corn has begun to tiller at the time it is ufed, the roots will be, in many inftances, fubdivided, and then the application of my fyftem of divifibility comes into play. The roller then ferves to plant the roots which have been torn up by the harrow."

132 Objections.

But on this the Society obferve, that the teeth of a harrow are too large to divide roots fo fmall and tenacious as are thofe of grain; and whenever fuch roots (however tillered) ftand in the line any tooth makes, they will, if fmall, be only turned on one fide by the earth yielding to their lateral preffure, or, if large, the whole root will probably be drawn out of the ground. The principal ufes, therefore, derived from harrowing and rolling thefe crops are, opening the foil between the plants, earthing them up, breaking the clods, and clofing the earth about their roots.

In a fubfequent letter, Mr Bogle, without contefting thefe points, further urges the fcheme of propagating wheat by dividing and tranfplanting its roots. "I have converfed (fays he) much with many practical farmers, who all admit that my plan has the appearance not only of being practical, but advantageous. I have alfo feen in the ninth number of Mr Young's Annals of Agriculture, the account of an experiment which ftrongly corroborates my theory. It was made by the Rev. Mr Pike of Edmonton. From this, and other experiments

experiments which have been made under my own eye, I foreſee clearly, that the ſyſtem is practicable, and will certainly be productive of great benefit, ſhould it become general. Beſides the ſaving of nine-tenths of ſeed in the land ſown broad-caſt, other very important advantages will attend the ſetting out of wheat from a ſeed-bed, ſuch as an early crop; the certainty of good crops; rendering a ſummer fallow unneceſſary; ſaving dung; and having your wheat perfectly free from weeds without either hand or horſe-hoeing. Five hundred plants in April produced almoſt a buſhel of grain. My gardener ſays, he can ſet one thouſand plants in a day, which is confirmed by the opinion of two other gardeners. Mr Miller found no difference in the produce of what was planted on lands that had dung, and on what had none, except where the land was improper for wheat at all."

133 Practicability of the ſcheme aſſerted.

134 Bath Society's obſervations.

On this letter we have the following note by the ſociety: "Mr Bogle will ſee, by the ſociety's premium-book this year, that by having offered ſeveral premiums for experiments of the kind he ſo earneſtly recommends, we wiſh to have his theory brought to the teſt of practice. Our reaſon for this, as well as for printing Mr B's letter, was rather to excite deciſive trials by ingenious perſons, than from any expectation of the practice ever becoming a general one. General, indeed, it never can be. A ſufficient number of hands could not be found to do it. Unkindly ſeaſons at the time of tranſplanting and dividing the roots would frequently endanger and injure, if not deſtroy the crops. But admitting the mode generally practicable, we very much doubt whether all the advantages he has enumerated would be derived from this mode of culture. Why ſhould dividing and tranſplanting the roots of wheat cauſe the crop to be early, or afford a *certainty* of its being *a good one?* We cannot think that *leſs manure* is neceſſary in this method, than either in drilling or broad-caſt; nor can we by any means admit, that ſuch crops would "be perfectly free from weeds without either hand or horſe-hoeing." We readily agree with Mr Bogle, that by this mode of culture on a general ſcale, an immenſe quantity of ſeed-corn would be annually ſaved to the nation; and in this, we believe, the advantage, were it practicable, would principally conſiſt."

135 Further obſervations of Mr Bogle.

Upon the ſame ſubject, and that of harrowing all kinds of corn, we are informed, Mr Bogle afterwards communicated to the Society his thoughts more at large, together with authentic accounts which were made at his inſtance, and which were attended with very great ſucceſs. Theſe, however, were received too late for publication in the laſt (3d) volume of their papers. But the Society, conceiving his ſyſtem may be attended with conſiderable advantages if brought into general practice, have given, at the end of the volume, a few of his leading principles. Mr Bogle ſtates, 1. That he has known many inſtances of very great crops having been obtained by harrowing fields of corn after they were ſprouted; and therefore recommends the practice very warmly.

2. That he has alſo received an authentic account of one inſtance where the ſame good effects were produced by ploughing the field.

3. On the ſyſtem of tranſplanting, he ſtates, that a very great proportion of the ſeed will be ſaved, as a farmer may have a nurſery, or ſmall patch of plants, from which his fields may be ſupplied; he calculates that one acre will yield plants ſufficient for 100 acres.

4. That a very great increaſe of crops may be obtained by this method, probably a double crop, nay perhaps a triple quantity of what is reaped either by drilling, or by the broad-caſt huſbandry.

5. That a great part of the labour may be performed by infirm men and women, and alſo by children, who are at preſent ſupported by the pariſh charity; and that of courſe the poor's rates may be conſiderably reduced.

6. That the expence will not exceed from 20s. to 30s. per acre, if the work be performed by able-bodied men and women; but that it will be much lower, if that proportion of the work which may be done by employing young boys and girls ſhould be allotted to them.

7. That in general he has found the diſtance of nine inches every way a very proper diſtance for ſetting out the plants at; but recommends them to be tried at other ſpaces, ſuch as ſix, eight, or even 12 inches.

8. That he conceives an earlier crop may be obtained in this manner than can be obtained by any other mode of cultivation.

9. That a clean crop may alſo be procured in this way, becauſe if the land be ploughed immediately before the plants are ſet out, the corn will ſpring much quicker from the plants than the weeds will do from their ſeeds, and the corn will thereby bear down the growth of the weeds.

10. That ſuch lands as are overflowed in the winter and ſpring, and are of courſe unfit for ſowing with wheat in the autumn, may be rendered fit for crops of wheat by planting them in the ſpring, or even in the ſummer.

11. That he has known inſtances of wheat being tranſplanted in September, October, November, February, March, April, and even as late as the middle of May, which have all anſwered very well.

12. That he has known an early kind of wheat ſown as late as the middle of May, which has ripened in very good time; and from that circumſtance he conceives, if the plants ſhould be taken from that early kind, the ſeaſon of tranſplanting might be prolonged at leaſt till the 1ſt of July, perhaps even later.

13. That he has reaſon to think wheat, oats, and barley, are not annuals, but are perennials, provided they are eaten down by cattle and ſheep, or are kept low by the ſcythe or ſickle; and are prevented from ſpindling or coming to the ear.

14. That one very prevalent motive with him in proſecuting this plan, is, that he is of opinion it may enable Government to deviſe means of ſupporting the vagrant poor, both old and young, who are now to be met with every where, both in towns and in the country, and who are at preſent a burden on the community: but if ſuch employment could be ſtruck out for them, a comfortable ſubſiſtence might be provided for them by means of their own labour and induſtry; and not only ſave the public and private charitable contributions, but may alſo render that claſs of people uſeful and profitable ſubjects; inſtead of their remaining in a uſeleſs, wretched, and perhaps a profligate and vicious courſe of life.

Laſtly, Mr Bogle has hinted at a ſecondary object which

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which he has in view, from this mode of cultivation, which he apprehends may in time, with a ſmall degree of attention, prove extremely advantageous to agriculture.—It is, that in the firſt place, the real and intrinſic value of different kinds of grain may be more accurately aſcertained by making a compariſon of it with a few plants of each kind ſet out at the ſame time, than can be done when ſown in drills or broad-caſt; and when the moſt valuable kinds of wheat, oats, or barley, are diſcovered, he ſtates, that in a very ſhort time (not exceeding four or five years) a ſufficient quantity of that valuable kind may be procured to ſupply the kingdom with ſeed from a ſingle grain of each kind; for he calculates, that 47,000 grains of wheat may be produced by diviſibility in two years and three months.

136 Obſervation of the Bath Society.

Upon theſe propoſitions the Society obſerves, "That although Mr Bogle appears to be too ſanguine in his expectations of ſeeing his plan realized in *general practice*, it certainly merits the attention of Gentlemen Farmers. We wiſh them to make fair experiments, and report their ſucceſs. Every grand improvement has been, and ever will be, progreſſive. They muſt neceſſarily originate with gentlemen; and thence the circle is extended by almoſt imperceptible degrees over provinces and countries. At all events, Mr Bogle is juſtly intitled to the thanks of the Society, and of the public, for the great attention he has paid to the ſubject."

2. Oats.

137 Effect of froſt upon tilled land.

As winter-ploughing enters into the culture of oats, we muſt remind the reader of the effect of froſt upon tilled land. Providence has neglected no region intended for the habitation of man. If in warm climates the ſoil be meliorated by the ſun, it is no leſs meliorated by froſt in cold climates. Froſt acts upon water, by expanding it into a larger ſpace. Froſt has no effect upon dry earth; witneſs ſand, upon which it it makes no impreſſion. But upon wet earth it acts moſt vigorouſly: it expands the moiſture, which requiring more ſpace puts every particle of the earth out of its place, and ſeparates them from each other. In that view, froſt may be conſidered as a plough ſuperior to any that is made, or can be made, by the hand of man: its action reaches the minuteſt particles; and, by dividing and ſeparating them, it renders the ſoil looſe and friable. This operation is the moſt remarkable in tilled land, which gives free acceſs to froſt. With reſpect to clay-ſoil in particular, there is no rule in huſbandry more eſſential than to open it before winter in hopes of froſt. It is even adviſable in a clay-ſoil to leave the ſtubble rank; which, when ploughed in before winter, keeps the clay looſe, and admits the froſt into every cranny.

To apply this doctrine, it is dangerous to plough clay-ſoil when wet; becauſe water is a cement for clay, and binds it ſo as to render it unfit for vegetation. It is, however, leſs dangerous to plough wet clay before winter than after. A ſucceeding froſt corrects the bad effects of ſuch ploughing; a ſucceeding drought increaſes them.

138 Culture of oats.

The common method is, to ſow oats on new-ploughed land in the month of March, as ſoon as the ground is tolerably dry. If it continue wet all the month of March, it is too late to venture them after. It is much better to ſummer-fallow, and to ſow wheat in the autumn. But the preferable method, eſpecially in clay-ſoil, is to turn over the field after harveſt, and to lay it open to the influences of froſt and air, which leſſen the tenacity of clay, and reduce it to a free mould. The ſurface-ſoil by this means is finely mellowed for reception of the ſeed; and it would be a pity to bury it by a ſecond ploughing before ſowing. In general, the bulk of clay-ſoils are rich; and ſkilful ploughing without dung, will probably give a better crop, than unſkilful ploughing with dung.

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Hitherto of natural clays. We muſt add a word of carſe-clays which are artificial, whether left by the ſea, or ſweeped down from higher grounds by rain. The method commonly uſed of dreſſing carſe-clay for oats, is, not to ſtir it till the ground be dry in the ſpring, which ſeldom happens before the firſt of March, and the ſeed is ſown as ſoon after as the ground is ſufficiently dry for its reception. Froſt has a ſtronger effect on ſuch clays than on natural clay. And if the field be laid open before winter, it is rendered ſo looſe by froſt as to be ſoon drenched in water. The particles at the ſame time are ſo ſmall, as that the firſt drought in ſpring makes the ſurface cake or cruſt. The difficulty of reducing this cruſt into mould for covering the oat-ſeed, has led farmers to delay ploughing till the month of March. But we are taught by experience, that this ſoil ploughed before winter, is ſooner dry than when the ploughing is delayed till ſpring; and as early ſowing is a great advantage, the objection of the ſuperficial cruſting is eaſily removed by the firſt harrow above deſcribed, which will produce abundance of mould for covering the ſeed. The ploughing before winter not only procures early ſowing, but has another advantage: the ſurface-ſoil that had been mellowed during winter by the ſun, froſt, and wind, is kept above.

The dreſſing a loamy ſoil for oats differs little from dreſſing a clay ſoil, except in the following particular, that being leſs hurt by rain, it requires not high ridges, and therefore ought to be ploughed crown and furrow alternately.

Where there is both clay and loam in a farm, it is obvious from what is ſaid above, that the ploughing of the clay after harveſt ought firſt to be diſpatched. If both cannot be overtaken that ſeaſon, the loam may be delayed till the ſpring with leſs hurt.

Next of a gravelly ſoil; which is the reverſe of clay, as it never ſuffers but from want of moiſture. Such a ſoil ought to have no ridges; but be ploughed circularly from the centre to the circumference, or from the circumference to the centre. It ought to be tilled after harveſt: and the firſt dry weather in ſpring ought to be laid hold of to ſow, harrow, and roll; which will preſerve it in ſap.

The culture of oats is the ſimpleſt of all. That grain is probably a native of Britain: it will grow on the worſt ſoil with very little preparation. For that reaſon, before turnip was introduced, it was always the firſt crop upon land broken up from the ſtate of nature.

Upon ſuch land, may it not be a good method, to build upon the crown of every ridge, in the form of a wall, all the ſurface-earth, one ſod above another, as in a fold for ſheep? After ſtanding in this form all the ſummer and winter, let the walls be thrown down, and the ground prepared for oats. This will ſecure

Practice. fecure one or two good crops; after which the land may be dunged for a crop of barley and grafs-feeds. This method may anfwer in a farm where manure is fcanty.

3. Barley.

139
Culture of barley.

This is a culmiferous plant that requires a mellow foil. Upon that account, extraordinary care is requifite where it is to be fown in clay. The land ought to be ftirred immediately after the foregoing crop is removed, which lays it open to be mellowed with the froft and air. In that view, a peculiar fort of ploughing has been introduced, termed *ribbing;* by which the greateft quantity of furface poffible is expofed to the air and froft. The obvious objection to this method is, that half of the ridge is left unmoved. And to obviate that objection, the following method is offered, which moves the whole foil, and at the fame time expofes the fame quantity of furface to the froft and air.

140
Ribbing.

141
A better method.

As foon as the former crop is off the field, let the ridges be gathered with as deep a furrow as the foil will admit, beginning at the crown and ending at the furrows. This ploughing loofens the whole foil, giving free accefs to the air and froft. Soon after, begin a fecond ploughing in the following manner. Let the field be divided by parallel lines crofs the ridges, with intervals of 30 feet or fo. Plough once round an interval, beginning at the edges, and turning the earth toward the middle of the interval; which covers a foot or fo of the ground formerly ploughed. Within that foot plough another round fimilar to the former; and after that, other rounds, till the whole interval be finifhed, ending at the middle. Inftead of beginning at the edges, and ploughing toward the middle, it will have the fame effect to begin at the middle and to plough toward the edges. Plough the other intervals in the fame manner. As by this operation the furrows of the ridges will be pretty much filled up, let them be cleared and water-furrowed without delay. By this method, the field will be left waving like a plot in a kitchen-garden, ridged up for winter. In this form, the field is kept perfectly dry; for befide the capital furrows that feparate the ridges, every ridge has a number of crofs furrows that carry the rain inftantly to the capital furrows. In hanging grounds retentive of moifture, the parallel lines above mentioned ought not to be perpendicular to the furrows of the ridges, but to be directed a little downward, in order to carry rain-water the more haftily to thefe furrows. If the ground be clean, it may lie in that ftate winter and fpring, till the time of feed-furrowing. If weeds happen to rife, they muft be deftroyed by ploughing, or brakeing, or both; for there cannot be worfe hufbandry, than to put feed into dirty ground.

142
Advantages of this method.

This method refembles common ribbing in appearance, but is very different in reality. As the common ribbing is not preceded by a gathering furrow, the half of the field is left untilled, compact as when the former crop was removed, impervious in a great meafure to air or froft. The common ribbing at the fame time lodges the rain-water on every ridge, preventing it from defcending to the furrows; which is hurtful in all foils, and poifonous in a clay foil. The *ftitching* here defcribed, or *ribbing*, if you pleafe to call it fo, prevents thefe noxious effects. By the two ploughings the whole foil is opened, admitting freely air and froft; and the multitude of furrows lays the furface perfectly dry, giving an early opportunity for the barley-feed.— But further, as to the advantage of this method: When it is proper to fow the feed, all is laid flat with the brake, which is an eafy operation upon foil that is dry and pulverized; and the feed-furrow which fucceeds, is fo fhallow as to bury little or none of the furface-earth: whereas the ftirring for barley is commonly done with the deepeft furrow; and confequently buries all the furface-foil that was mellowed by the froft and air. Nor is this method more expenfive; becaufe the common ribbing muft always be followed with a ftirring furrow, which is faved in the method recommended. Nay, it is lefs expenfive; for after common ribbing, which keeps in the rain water, the ground is commonly fo foured, as to make the ftirring a laborious work.

143
Management of feed in a dry feafon.

It is well known that barley is lefs valuable when it does not ripen equally; and that barley which comes up fpeedily in a dufky foil, muft gain a great advantage over feed-weeds. Therefore, firft take out about one-third of the contents of the facks of feed barley or bear, to allow for the fwelling of the grain. Lay the facks with the grain to fteep in clean water; let it lie covered with it for at leaft 24 hours. When the ground is fo dry as at prefent, and no likelihood of rain for 10 days, it is better to lie 36 hours. Sow the grain wet from fteeping, without any addition of powdered quick-lime, which, though often recommended in print, can only poifon the feed, fuck up part of its ufeful moifture, and burn the hands of the fower. The feed will fcatter well, as clean water has no tenacity; only the fower muft put in a fourth or a third more feed in bulk than ufual of dry grain, as the grain is fwelled in that proportion: harrow it in as quickly as poffible after it is fown; and though not neceffary, give it the benefit of frefh furrow, if convenient. You may expect it up in a fortnight at fartheft.

The following experiment by a correfpondent of the Bath Society being confidered as a very interefting one, is here fubjoined.

144
Important experiments on feed-barley.

"The laft fpring (1783) being remarkably dry, I foaked my feed-barley in the black water taken from a refervoir which conftantly receives the draining of my dung-heap and ftables. As the light corn floated on the top, I fkimmed it off, and let the reft ftand 24 hours. On taking it from the water, I mixed the feed grain with a fufficient quantity of fifted wood-afhes, to make it fpread regularly, and fowed three fields with it. I began fowing the 16th, and finifhed the 23d of April. The produce was 60 bufhels per acre, of good clean barley, without any *fmall* or *green* corn, or weeds at harveft. No perfon in this country had better grain.

I fowed alfo feveral other fields with the fame feed dry, and without any preparation; but the crop, like thofe of my neighbours, was very poor; not more than twenty bufhels per acre, and much mixed with *green* corn and weeds when harvefted. I alfo fowed fome of the feed dry on one ridge in each of my former fields, but the produce was very poor in comparifon of the other parts of the field."

Where the land is in good order, and free of weeds,

April

145 Time of ſowing.

April is the month for ſowing barley. Every day is proper, from the firſt to the laſt.

The dreſſing loamy ſoil and light ſoil for barley, is the ſame with that deſcribed; only that to plough dry is not altogether ſo eſſential as in dreſſing clay-ſoil. Loam or ſand may be ſtirred a little moiſt: better, however, delay a week or two, than to ſtir a loam when moiſt. Clay muſt never be ploughed moiſt, even tho' the ſeaſon ſhould eſcape altogether. But this will ſeldom be neceſſary; for not in one year of 20 will it happen, but that clay is dry enough for ploughing ſome time in May. Froſt may correct clay ploughed wet after harveſt; but ploughed wet in the ſpring, it unites into a hard maſs, not to be diſſolved but by very hard labour.

On the cultivation of this grain we have the following obſervations by a Norfolk farmer.

146 Miſcellaneous obſervations concerning the cultivation of barley.

The beſt ſoil, he obſerves, is that which is dry and healthy, rather light than ſtiff, but yet of ſufficient tenacity and ſtrength to retain the moiſture. On this kind of land the grain is always the beſt bodied and coloured, the nimbleſt in the hand, and has the thinneſt rind. Theſe are qualities which recommend it moſt to the maltſter. If the land is poor, it ſhould be dry and warm; and when ſo, it will often bear better corn than richer land in a cold and wet ſituation.

In the choice of your ſeed, it is needful to obſerve, that the beſt is of a pale lively colour, and brightiſh caſt, without any deep redneſs or black tinge at the tail. If the rind be a little ſhrivelled, it is the better; for that ſlight ſhrivelling proves it to have a thin ſkin, and to have ſweated in the mow. The neceſſity of a change of ſeed by not ſowing two years together what grew on the ſame ſoil, is not in any part of huſbandry more evident than in the culture of this grain, which, if not frequently changed, will grow coarſer and coarſer every ſucceeding year.

It has generally been thought that ſeed-barley would be benefited by ſteeping; but liming it has, in many inſtances, been found prejudicial. Sprinkling a little ſoot with the water in which it is ſteeped has been of great ſervice, as it will ſecure the ſeed from inſects. In a very dry ſeed-time, barley that has been wetted for malting, and begins to ſprout, will come up ſooner, and produce as good a crop as any other.

If you ſow after a fallow, plough three times at leaſt. At the firſt ploughing, lay your land up in ſmall ridges, and let it remain ſo during the winter, for the froſt to mellow it; the ſecond ploughing ſhould be the beginning of February. In March ſplit the ridges, and lay the land as flat as poſſible, at the ſame time harrowing it fine. But in ſtrong wet lands (if you have no other for barley) lay it round, and make deep furrows to receive the water.

" I have often (continues he), taken the following method with ſucceſs: On lands tolerably manured, I ſowed clover with my barley, which I reaped at harveſt; and fed the clover all the following winter, and from ſpring to July, when I fallowed it till the following ſpring, and then ſowed it with barley and clover as before. Repeating this method every year I had very large crops, but would not recommend this practice on poor light land.

" We ſow on our lighteſt lands in April, on our moiſt lands in May; finding that thoſe lands which are the moſt ſubject to weeds produce the beſt crops when ſown late.

" The common method is to ſow the barley-ſeed broad-caſt at two ſowings; the firſt harrowed in once, the ſecond twice; the uſual allowance from three to four buſhels per acre. But if farmers could be prevailed on to alter this practice, they would ſoon find their account in it. Were only half the quantity ſown equally, the produce would be greater, and the corn leſs liable to lodge: For when corn ſtands very cloſe, the ſtalks are drawn up weak; and on that account are leſs capable of reſiſting the force of winds, or ſupporting themſelves under heavy rains.

" From our great ſucceſs in ſetting and drilling wheat, ſome of our farmers tried theſe methods with barley; but did not find it anſwer their expectations, except on very rich land.

" I have myſelf had 80 ſtalks on one root of barley, which all produced good and long ears, and the grain was better than any other; but the method is too expenſive for general practice. In poor land, ſow thin, or your crop will be worth little. Farmers who do not reaſon on the matter, will be of a different opinion; but the fact is indiſputable."

When the barley is ſowed and harrowed in, he adviſes that the land be rolled after the firſt ſhower of rain, to break the clods. This will cloſe the earth about the roots, which will be a great advantage to it in dry weather.

When the barley has been up three weeks or a month, it is a very good way to roll it again with a heavy roller, which will prevent the ſun and air from penetrating the ground to the injury of the roots. This rolling, before it branches out, will alſo cauſe it to tiller into a greater number of ſtalks; ſo that if the plants be thin, the ground will be thereby filled, and the ſtalks ſtrengthened.

If the blade grows too rank, as it ſometimes will in a warm wet ſpring, mowing is a much better method than feeding it down with ſheep; becauſe the ſcythe takes off only the rank tops, but the ſheep being fond of the ſweet end of the ſtalk next the root, will often bite ſo cloſe as to injure its future growth.

4. Buck-wheat.

147 Culture of Buck-wheat.

The uſes of this plant have been mentioned in the preceding part, n° 46. It delights in a mellow ſandy ſoil; but ſucceeds well in any dry looſe healthy land, and moderately ſo in a free loamy ſtone-braſh. A ſtiff clay is its averſion, and it is entirely labour loſt to ſow it in wet poachy ground. The proper ſeaſon for ſowing is from the laſt week of May or the beginning of June. It has been ſown, however, ſo early as the beginning of April, and ſo late as the 22d of July, by way of experiment; but the latter was rather extreme to be choſen, and the former was in danger from froſt. In an experiment upon a ſmall piece of groun ., the grain of two different crops was brought to maturity in the ſummer 1787.—After ſpring feedings, a crop of turnip-rooted cabbage, or vetches, there will be ſufficient time to ſow the land with buck-weat. Probably, in hot dry ſummers, a crop of vetches might even be mown for hay early enough to introduce a crop of this grain after it.

In the year 1780, about ſeven acres of a ſandy ſoil on

Practice. on Brislington Common (A), having been first tolerably well cleansed from brambles, furze, &c. received one ploughing. To reduce the irregularities of the surface, it was rolled; and on the 9th of June in that year, two bushels and a half of buck-weak per acre sown, the ground rolled again without harrowing.

148 Advantages of this cropping. The vegetation appeared in five or six days, as is constantly the case be the weather wet or dry. The growth was so rapid, that the fern, with which this land greatly abounded, was completely kept under. About the middle of September the crop was mown, but by reason of a great deal of rain about that time, it was not secured until the beginning of October; hence a loss of great part of the grain by shedding, as well as some eaten by birds. However, there were saved about 24 Winchester bushels per acre; and, notwithstanding its long exposure to the weather, received no sort of damage, only perhaps that the finest and most perfect grain was the first to fall from the plant. The ground after this had almost the appearance of a fallow, and was immediately ploughed.

When it had lain a moderate time to meliorate, and to receive the influences of the atmosphere, it was harrowed, sown with Lammas wheat, and ploughed in under furrow, in a contrary direction to the first ploughing. Thus a piece of land, which in the month of April was altogether in a state of nature, in the following November was seen under a promising crop of what is well styled the king of grain, and this without the aid of manure, or of any very great degree of tillage. Nor was the harvest by any means deficient; for several persons conversant in such things estimated the produce from 26 to 30 bushels per acre. As soon as the wheat crop was taken off, the ground had one ploughing, and on the first of September following was sown with turnip-seed. The turnips were not large, but of an herbage so abundant as in the following spring to support 120 ewes with their lambs, which were fed on it by folding four weeks. After this it was manured with a composition of rotten dung and natural earth, about 20 putt loads per acre, and planted with potatoes. The crop sold for L. 138, besides a considerable number used in the family, and a quantity reserved with which ten acres were planted the following season. The ensuing autumn it was again sown with wheat, and produced an excellent crop. In the spring of 1784, it was manured and planted with potatoes, as in the preceding instance; the crop (tho' tolerably good) by no means equal to the former, producing about 100 sacks per acre only. In spring 1785, the land was now for a third time under a crop of wheat, it being intended to try how far this mode of alternate cropping, one year with potatoes and another with wheat, may be carried.

From the success of the preceding and other experiments, by Nehemiah Bartley, Esq; of Bristol, as detailed in the Bath Society Papers, it would seem, that the culture of this plant ought in many cases to be adopted instead of a summer-fallowing: for the crop produced appears not only to be so much clear gain in respect to such practice, but also affords a considerable quantity of straw for fodder and manure; beside that a summer-fallowing is far from being so advantageous a preparation for a succeeding crop. Practice.

5. Beans.

The properest soil for beans is a deep and moist clay. 149 Culture of beans.

There was lately introduced into Scotland a method of sowing beans with a drill-plough, and horse-hoeing the intervals; which, beside affording a good crop, is a dressing to the ground. But as that method is far from being general, we keep in the common track.

As this grain is early sown, the ground intended for it should be ploughed before winter, to give access to the frost and air; beneficial in all soils, and necessary in a clay soil. Take the first opportunity after January when the ground is dry, to loosen the soil with the harrow first described, till a mould be brought upon it. Sow the seed, and cover it with the second harrow. The third will smooth the surface, and cover the seed equally. These harrows make the very best figure in sowing beans; which ought to be laid deep in the ground, not less than six inches. In clay soil, the common harrows are altogether insufficient. The soil, which has rested long after ploughing, is rendered compact and solid: the common harrows skim the surface: the seed is not covered; and the first hearty shower of rain lays it above ground. Where the farmer overtakes not the ploughing after harvest, and is reduced to plough immediately before sowing, the plough answers the purpose of the first harrow; and the other two will complete the work. But the labour of the first harrow is ill saved; as the ploughing before winter is a fine preparation, not only for beans, but for grain of every kind. If the ground ploughed before winter happen by superfluity of moisture to cake, the first harrow going along the ridges, and crossing them, will loosen the surface, and give access to the air for drying. As soon as the ground is dry, sow without delaying a moment. If rain happen in the interim, there is no remedy but patience till a dry day or two come.

Carse-clay, ploughed before winter, seldom fails to cake. Upon that account, a second ploughing is necessary before sowing; which ought to be performed with an ebb furrow, in order to keep the frost-mould as near the surface as possible. To cover the seed with the plow is expressed by the phrase *to sow under furrow*. The clods raised in this ploughing are a sort of shelter to the young plants in the chilly spring-months.

The foregoing method will answer for loam. And as for a sandy or gravelly soil, it is altogether improper for beans.

Though we cannot approve the horse-hoeing of beans, with the invervals that are commonly allotted for turnip, yet we would strongly recommend the drilling them at the distance of 10 or 12 inches, and keeping the intervals clean of weeds. This may be done by hand-hoeing, taking opportunity at the same time to lay fresh soil to the roots of the plants. But as this is an expensive operation, and hands are not always to be got, a narrow plough, drawn by a single horse, might be used, with a mould-board on each side to scatter the earth

(A) A very rough piece of land, at that time just inclosed.

Practice.

earth upon the roots of the plants. This is a cheap and expeditious method: it keeps the ground clean; and nourishes the plants with fresh soil.

As beans delight in a moist soil, and have no end of growing in a moist season, they cover the ground totally when sown broadcast, keep in the dew, and exclude the sun and air: the plants grow to a great height; but carry little seed, and that little not well ripened. This displays the advantage of drilling; which gives free access to the sun and air, dries the ground, and affords plenty of ripe seed.

6. Pease.

150 Culture of pease.

Pease are of two kinds; the white, and the gray. The cultivation of the latter only belongs to this place.

There are two species of the gray kind, distinguished by their time of ripening. One ripens soon, and for that reason is termed *hot seed:* the other, which is slower in ripening, is termed *cold seed.*

Pease, a leguminous crop, is proper to intervene between two culmiferous crops; less for the profit of a pease-crop, than for meliorating the ground. Pease, however, in a dry season, will produce six or seven bolls each acre; but, in an ordinary season, they seldom reach above two, or two and a half. Hence, in a moist climate, which all the west of Britain is, red clover seems a more beneficial crop than pease; as it makes as good winter-food as pease, and can be cut green thrice during summer.

A field intended for cold seed ought to be ploughed in October or November; and in February, as soon as the ground is dry, the seed ought to be sown on the winter-furrow. A field intended for hot seed ought to be ploughed in March or April, immediately before sowing. But if infested with weeds, it ought to be also ploughed in October or November.

Pease laid a foot below the surface will vegetate; but the most approved depth is six inches in light soil, and four inches in clay soil; for which reason, they ought to be sown under furrow when the ploughing is delayed till spring. Of all grain, beans excepted, they are the least in danger of being buried.

Pease differ from beans, in loving a dry soil and a dry season. Horse-hoeing would be a great benefit, could it be performed to any advantage; but pease grow expeditiously, and soon fall over and cover the ground, which bars ploughing. Horse-hoeing has little effect when the plants are new sprung; and when they are advanced to be benefited by that culture, their length prevents it. Fast growing at the same time is the cause of their carrying so little seed: the seed is buried among the leaves; and the sun cannot penetrate to make it grow and ripen. The only practicable remedy to obtain grain, is thin sowing; but thick sowing produces more straw, and mellows the ground more. Half a boll for an English acre may be reckoned thin sowing; three firlots, thick sowing.

Notwithstanding what is said above, Mr Hunter, a noted farmer in Berwickshire, began some time ago to sow all his pease in drills; and never failed to have great crops of corn as well as of straw. He sowed double rows at a foot interval, and two feet and an half between the double rows, which admit horse-hoeing. By that method, he had also good crops of beans on light land.

Pease and beans mixed are often sown together, in order to catch different seasons. In a moist season, the beans make a good crop; in a dry season, the pease.

The growth of plants is commonly checked by drought in the month of July; but promoted by rain in August. In July, grass is parched; in August, it recovers verdure. Where pease are so far advanced in the dry season as that the seed begins to form, their growth is indeed checked, but the seed continues to fill. If only in the blossom at that season, their growth is checked a little; but they become vigorous again in August, and continue growing without filling till stopped by frost. Hence it is, that cold seed, which is early sown, has the best chance to produce corn: hot seed, which is late sown, has the best chance to produce straw.

The following method is practised in Norfolk, for sowing pease upon a dry light soil, immediately opened from pasture. The ground is pared with a plough extremely thin, and every sod is laid exactly on its back. In every sod a double row of holes is made. A pea dropt in every hole lodges in the flay'd ground immediately below the sod, thrusts its roots horizontally, and has sufficient moisture. This method enabled Norfolk farmers, in the barren year 1740, to furnish white pease at 12s. per boll.

II. Plants cultivated for Roots. [*See also Art. III.*]

1. Turnip.

Turnip delights in a gravelly soil; and there it can be raised to the greatest perfection, and with the least hazard of miscarrying. At the same time, there is no soil but will bear turnip when well prepared. 151 Culture of turnip.

No person ever deserved better of a country, than he who first cultivated turnip in the field. No plant is better fitted for the climate of Britain, no plant prospers better in the coldest part of it, and no plant contributes more to fertility. In a word, there has not for two centuries been introduced into Britain a more valuable improvement.

Of all roots, turnip requires the finest mould; and to that end, of all harrows frost is the best. In order to give access to frost, the land ought to be prepared by ribbing after harvest, as above directed in preparing land for barley. If the field be not subject to annuals, it may lie in that state till the end of May; otherwise the weeds must be destroyed by a brakeing about the middle of April; and again in May, if weeds rise. The first week of June, plough the field with a shallow furrow. Lime it if requisite, and harrow the lime into the soil. Draw single furrows with intervals of three feet, and lay dung in the furrows. Cover the dung sufficiently, by going round it with the plough, and forming the three-feet spaces into ridges. The dung comes thus to lie below the crown of every ridge.

The season of sowing must be regulated by the time intended for feeding. Where intended for feeding in November, December, January, and February, the seed ought to be sown from the 1st to the 20th of June. Where the feeding is intended to be carried on to March, April, and May, the seed must not be sown till the end of July. Turnip sown earlier than above directed, flowers that very summer, and runs fast to seed; which renders it in a good measure unfit for food. 152 Season and method of sowing.

Practice.

food. If fown much later, it does not apple, and there is no food but from the leaves.

Though by a drill-plough the feed may be fown of any thicknefs, the fafeft way is to fow thick. Thin fowing is liable to many accidents, which are far from being counterbalanced by the expence that is faved in thinning. Thick-fowing can bear the ravage of the black fly, and leave a fufficient crop behind. It is a protection againft drought, gives the plants a rapid progrefs, and eftablifhes them in the ground before it is neceffary to thin them.

The fowing turnip broadcaft is univerfal in England, and common in Scotland, though a barbarous practice. The eminent advantage of turnip is, that befide a profitable crop, it makes a moft complete fallow; and the latter cannot be obtained but by horfe-hoeing. Upon that account, the fowing turnip in rows at three feet diftance is recommended. Wider rows anfwer no profitable end, ftraiter rows afford not room for a horfe to walk in. When the turnip is about four inches high, annual weeds will appear. Go round every interval with the flighteft furrow poffible, at the diftance of two inches from each row, moving the earth from the rows toward the middle of the interval. A thin plate of iron muft be fixed on the left fide of the plough, to prevent the earth from falling back and burying the turnip. Next, let women be employed to weed the rows with their fingers; which is better, and cheaper done, than with the hand-hoe. The hand-hoe, befide, is apt to difturb the roots of the turnip that are to ftand, and to leave them open to drought by removing the earth from them. The ftanding turnip are to be at the diftance of twelve inches from each other: a greater diftance makes them fwell too much; a lefs diftance affords them not fufficient room. A woman foon comes to be expert in finger-weeding. The following hint may be neceffary to a learner. To fecure the turnip that is to ftand, let her cover it with the left hand; and with the right pull up the turnip on both fides. After thus freeing the ftanding turnip, fhe may fafely ufe both hands. Let the field remain in this ftate till the appearance of new annuals make a fecond ploughing neceffary; which muft be in the fame furrow with the former, but a little deeper. As in this ploughing the iron plate is to be removed, part of the loofe earth will fall back on the roots of the plants: the reft will fill the middle of the interval, and bury every weed. When weeds begin again to appear, then is the time for a third ploughing in an oppofite direction, which lays the earth to the roots of the plants. This ploughing may be about the middle of Auguft; after which, weeds rife very faintly. If they do rife, another ploughing will clear the ground of them. Weeds that at this time rife in the row, may be cleared with a hand-hoe, which can do little mifchief among plants diftant twelve inches from each other. It is certain, however, that it may be done cheaper with the hand (A). And after the leaves of turnips in a row meet together, the hand is the only inftrument that can be applied for weeding.

Practice.

In fwampy ground, the furface of which is beft reduced by paring and burning, the feed may be fown in rows with intervals of a foot. To fave time, a drill-plough may be ufed that fows three or four rows at once. Hand-hoeing is proper for fuch ground; becaufe the foil under the burnt *ftratum* is commonly full of roots, which digeft and rot better under ground than when brought to the furface by the plough. In the mean time, while thefe are digefting, the afhes will fecure a good crop.

153 Properties of different forts of turnip.

In cultivating turnips to advantage, great care fhould be taken to procure good, bright, nimble, and well-dried feed, and of the beft kinds.

The Norfolk farmers generally raife the oval white, the large green-topp'd, and the red or purple-topp'd kinds, which from long experience they have found to be the moft profitable.

The roots of the green-topp'd will grow to a large fize, and continue good much longer than others. The red or purple-topp'd will alfo grow large, and continue good to the beginning of February; but the roots become hard and ftringy fooner than the former.

The green-topp'd growing more above ground, is in more danger of fuftaining injury from fevere frofts than the red or purple, which are more than half covered by the foil; but it is the fofteft and fweeteft, when grown large, of any kind. We have feen them brought to table a foot in diameter, and equally good as garden turnips.

Turnips delight in a light foil, confifting of fand and loam mixed; for when the foil is rich and heavy, although the crop may be as great in weight, they will be rank, and run to flower earlier in fpring.

154 Obfervations with regard to feed.

Turnip-feed, like that of grain, will not do well without frequent changing. The Norfolk feed is fent to moft parts of the kingdom, and even to Ireland, but after two years it degenerates; fo that thofe who wifh to have turnips in perfection fhould procure it frefh every year from Norwich, and they will find their account in fo doing. For from its known reputation, many of the London feedfmen fell, under that character, feed raifed in the vicinity of the metropolis, which is much inferior in quality.

When the plants have got five leaves, they fhould be hoed, and fet out at leaft fix inches apart. A month afterward, or earlier if it be a wet feafon, a fecond hoeing fhould take place, and the plants be left at leaft 14 inches diftant from each other, efpecially if intended for feeding cattle; for where the plants are left thicker, they will be proportionably fmaller, unlefs the land is very rich indeed.

155 Methods of culture in Norfolk.

Some of the beft Norfolk farmers fow turnips in drills three feet afunder, and at a fecond hoeing leave them a foot a part in the rows. By this means the trouble and expence of hoeing is much leffened, and the crop of equal weight as when fown in the common

(A) Children under thirteen may be employed to weed turnip with the fingers. We have feen them go on in that work with alacrity; and a fmall premium will have a good effect. For boys and girls above thirteen, a hand-hoe adapted to their fize is an excellent inftrument: it ftrengthens the arms amazingly. In driving the plough, the legs only are exercifed; but as the arms are chiefly employed in hufbandry, they ought to be prepared beforehand by gentle exercife.

Practice.

mon method. The intervals may eafily be cleared of weeds by the horfe-hoe.

Great quantities of turnips are raifed in Norfolk every year for feeding black cattle, which turn to great advantage.

156 Value as food for cattle.

It is well known, that an acre of land contains 4840 fquare yards, or 43,560 fquare feet; fuppofe then that every fquare foot contains one turnip, and that they weigh only two pounds each on an average, here will be a mafs of food excellent in kind, of 46 tons per acre, often worth from four to five guineas, and fometimes more.

Extraordinary crops of barley frequently fucceed turnips, efpecially when fed off the land. In feeding them off, the cattle fhould not be fuffered to run over too much of the ground at once, for in that cafe they will tread down and fpoil twice as many as they eat. In Norfolk, they are confined by herdles to as much as is fufficient for them for one day. By this mode the crop is eaten clean, the foil is equally trodden, which if light, is of much fervice, and equally manured by the cattle.

A notion prevails in many places, that mutton fattened with turnips is thereby rendered rank and ill-tafted; but this is a vulgar error. The beft mutton in Norfolk (and few counties have better) is all fed with turnips. It is rank paftures, and marfhy lands, that produce rank mutton.

If the land be wet and fpringy, the beft method is to draw and carry off your turnips to fome dry pafture; for the treading of the cattle will not only injure the crop, but render the land fo ftiff, that you muft be at an additional expence in ploughing.

157 Method of preferving turnips.

To preferve turnips for late fpring feed, the beft method, and which has been tried with fuccefs by fome of the beft Englifh farmers, is, To ftack them up in dry ftraw; a load of which is fufficient to preferve 40 tons of turnips. The method is eafy, and as follows:—

After drawing your turnips in February, cut off the tops and tap roots, (which may be given to fheep), and let them lay a few days in the field, as no weather will then hurt them.

Then, on a layer of ftraw next the ground, place a layer of turnips two feet thick; and then another layer of ftraw, and fo on alternately, till you have brought the heap to a point. Care muft be taken to turn up the edges of the layers of ftraw, to prevent the turnips from rolling out; cover the top well with long ftraw, and it will ferve as a thatch for the whole.

In this method, as the ftraw imbibes the moifture exhaled from the roots, all vegetation will be prevented, and the turnips will be nearly as good in May as when firft drawn from the field. If ftraw be fcarce, old haulm or ftubble will anfwer the fame purpofe.

But to prevent this trouble and expence, perhaps farmers in all counties would find it moft to their intereft to adopt the method ufed by our neighbours the Norfolk farmers, which is, to continue fowing turnips to the latter end of Auguft; by which means their late crops remain good in the field till the latter end of April, and often till the middle of May.

The advantages of having turnips good till the fpring feed is generally ready, are fo obvious and fo great, that many of the moft intelligent farmers (although at firft prejudiced againft the practice) are now come into it, and find their account in fo doing.

2. Potatoes.

158 General culture.

The choice of foil is not of greater importance in any other plant than in a potato. This plant in clay foil, or in rank black loam lying low without ventilation, never makes palatable food. In a gravelly or fandy foil, expofed to the fun and to free air, it thrives to perfection, and has a good relifh. But a rank black loam, though improper to raife potatoes for the table, produces them in great plenty; and the product is, as already obferved, a palatable food for horned cattle, hogs, and poultry.

The fpade is a proper inftrument for raifing a fmall quantity, or for preparing corners or other places inacceffible to the plough; but for raifing potatoes in quantities, the plough is the only inftrument.

As two great advantages of a drilled crop are, to deftroy weeds, and to have a fallow at the fame time with the crop, no judicious farmer will think of raifing potatoes in any other way. In September or October, as foon as that year's crop is removed, let the field have a roufing furrow, a crofs-brakeing next, and then be cleared of weeds by the cleaning harrow. Form it into three-feet ridges, in that ftate to lie till April, which is the proper time for planting potatoes. Crofs-bake it, to raife the furrows a little. Then lay well-digefted horfe-dung along the furrows, upon which lay the roots at eight inches diftance. Cover up thefe roots with the plough, going once round every row. This makes a warm bed for the potatoes; hot dung below, and a loofe covering above, that admits every ray of the fun. As foon as the plants appear above ground, go round every row a fecond time with the plough, which will lay upon the plants an additional inch or two of mould, and at the fame time bury all the annuals; and this will complete the ploughing of the ridges. When the potatoes are fix inches high, the plough, with the deepeft furrow, muft go twice along the middle of each interval in oppofite directions, laying earth firft to one row, and next to the other. And to perform this work, a plough with a double mould-board will be more expeditious. But as the earth cannot be laid clofe to the roots by the plough, the fpade muft fucceed, with which four inches of the plants muft be covered, leaving little more but the tops above ground; and this operation will at the fame time bury all the weeds that have fprung fince the former ploughing. What weeds arife after muft be pulled up with the hand. A hoe is never to be ufed here: it cannot go fo deep as to deftroy the weeds without cutting the fibres of the plants; and if it fkim the furface, it only cuts off the heads of the weeds, and does not prevent their pufhing again.

159 Particular methods.

In the Bath Society Papers, we have the following practical obfervations on the culture and ufe of potatoes, given as the refult of various experiments made for five years fucceffively on that valuable root, the growth of which cannot be too much encouraged.

When the potato crop has been the only object in view, the following method is the moft eligible.

The land being well pulverized by two or three good harrowings and ploughings, is then manured with 15 or 20 cart-loads of dung per acre, before it receives its

laft

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In the end of September or the beginning of October, when the haulm becomes withered, they should be ploughed up with a strong double-breasted plough. The workman must be cautioned to set his plough very deep, that he may strike below all the potatoes, to avoid damaging the crop. The women who pick them up, if not carefully attended to, will leave many in the ground, which will prove detrimental to any succeeding corn, whether wheat or barley. To avoid which inconvenience, let the land be harrowed, and turn the swine in to glean the few that may be left by their negligence.

By this method, the sets will be 15 square inches from each other; it will take 18 bushels to plant an acre; and the produce, if on a good mixed loamy soil, will amount to 300 bushels.

If the potatoes are grown as a preparation for wheat, it is preferable to have the rows two feet two inches from each other, hand-hoeing only the space from plant to plant in each row; then turning a small furrow from the inside of each row by a common light plough, and afterwards with a double-breasted plough with one horse, split the ridge formed by the first ploughing thoroughly to clean the intervals. This work should not be done too deep the first time, to avoid burying the tender plants; but the last earth should be ploughed as deep as possible; and the closer the mould is thrown to the stems of the plants, the more advantageous it will prove. Thus 15 bushels will plant an acre, and the produce will be about 300 bushels; but the land, by the summer ploughings, will be prepared to receive seed-wheat immediately, and almost ensure a plentiful crop.

160 To prevent the grub. The potato-sets should be cut a week before planting, with one or two eyes to each, and the pieces not very small; two bushels of fresh slaked lime should be sown over the surface of the land as soon as planted, which will effectually prevent the attacks of the grub.

The expence attending an acre of potatoes well cultivated in the first method, supposing the rent 20 shillings, tithe and town charges rather high (as in Suffolk), taking up, and every thing included, will be about six pounds. In the last method, it would be somewhat reduced.

"When predilections for old customs are subdued (adds the author), I hope to see the potato admitted in the constant course of crops by every spirited husbandman. The most beneficial effects will, I am certain, accrue from such a system. The advantages in my neighbourhood are apparent; I cultivated and fed my own children upon them, and my poorer neighbours sensibly followed the example. A great proportion of every cottager's garden is now occupied by this root, and it forms a principal part of their diet. Potatoes are cheap and excellent substitutes for pease in soups and broths, allowing double the quantity.

161 A cheap preparation for the poor. "Although it is nearly a transcript of the directions given by a very ingenious author, yet I shall take the liberty of inserting a receipt for making a potato-soup, which I have weekly distributed amongst the poor to their great relief.

	s.	d.
An ox's head - - -	2	9
Two pecks of potatoes - -	0	6
Quarter of a peck of onions - -	0	3
Three quarters of a pound of salt -	0	1
An ounce and a half of pepper -	0	3
Total	3	10

Ninety pints of water to be boiled with the above ingredients on a slow fire until reduced to 60, which require one peck of coals, value threepence. I have added the expence of every article according to their prices with me, that gentlemen may nearly perceive at how easy a rate they can feed 60 of their poor neighbours. I find from experience, a pint of this soup, with a small piece of the meat, is sufficient to satisfy a hearty working man with a good meal. If vegetables are plentiful, some of every sort may be added, with a few sweet herbs.

"I hope my inserting the above, will not be esteemed improper; though somewhat deviating from the culture of potatoes, it may possibly be a means of rendering them more extensively useful."

A premium having been offered by the abovementioned Society for the cultivation of potatoes by farmers, &c. whose rent does not exceed 40l. per annum, the following methods were communicated, by which those who have only a small spot of ground may obtain a plentiful crop.

162 Methods of cultivating potatoes on small spots. First, then, the earth should be dug 12 inches deep, if the soil will allow of it; after this, a hole should be opened about six inches deep, horse-dung, or long litter should be put therein about three inches thick; this hole should not be more than 12 inches in diameter; upon this dung or litter, a potato should be planted whole, upon which a little more dung should be shook, and then earth must be put thereon. In like manner the whole plot of ground must be planted, taking care that each potato be at least 16 inches apart; and when the young shoots make their appearance, they should have fresh mould drawn round them with a hoe; and if the tender shoots are covered, it will prevent the frost from injuring them: they should again be earthed when the shoots make a second appearance, but not be covered, as in all probability the season will then be less severe. A plentiful supply of mould should be given them, and the person who performs this business should never tread upon the plant, or the hillock that is raised round it; as the lighter the earth is, the more room the potato will have to expand. From a single root thus planted, very near 40 pounds weight of large potatoes were obtained, and from almost every other root upon the same plot of ground from 15 to 20 pounds weight; and except the soil be stoney or gravelly, 10 pounds or half a peck of potatoes may almost always be obtained from each root, by pursuing the

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the foregoing method. But note, cuttings or ſmall ſets will not do for this purpoſe.

163 Methods of culture adapted to ſmallfarms.

The ſecond method will ſuit the indolent, or thoſe who have not time to dig their ground, and that is, where weeds much abound and have not been cleared in the winter, a trench may be opened in a ſtraight line the whole length of the ground, and about ſix inches deep; in this trench the potatoes ſhould be planted about 10 inches apart; cuttings or ſmall potatoes will do for this method. When they are laid in the trench, the weeds that are on the ſurface may be pared off on each ſide about 10 inches from it, and be turned upon the plants; another trench ſhould then be dug, and the mould that comes out of it turned carefully on the weeds. It muſt not be forgot, that each trench ſhould be regularly dug, that the potatoes may be throughout the plot 10 or 12 inches from each other. This ſlovenly method will in general raiſe more potatoes than can be produced by digging the ground twice, and dibbling in the plants; and the reaſon is, that the weeds lighten the ſoil, and give the roots room to expand. They ſhould be twice hoed, and earthed up in rows. And here note, that if cut potatoes are to be planted, every cutting ſhould have two eyes, for though fewer ſets will be obtained, there will be a greater certainty of a crop, as one eye often fails or is deſtroyed by grubs in the earth.

Where a crop of potatoes fail in part (as will ſometimes be the caſe in a dry ſeaſon), amends may ſtill be made by laying a little dung upon the knots of the ſtraw or haulm of thoſe potatoes that do appear, and covering them with mould; each knot or joint thus ordered will, if the weather prove wet afterwards, produce more potatoes than the original roots.

From the ſmalleſt potatoes planted whole, from four to ſix pounds at a root were obtained, and ſome of the ſingle potatoes weighed near two pounds. Theſe were dug in as before-mentioned, in trenches where the ground was covered with weeds, and the ſoil was a ſtiff loamy clay.

A good crop may be obtained by laying potatoes upon turf at about 12 or 14 inches apart, and upon beds of about ſix feet wide; on each ſide of which a trench ſhould be opened about three feet wide, and the turf that comes from thence ſhould be laid with the graſſy ſide downwards upon the potatoes; a ſpit of mould ſhould next be taken from the trenches, and be ſpread over the turf; and in like manner the whole plot of ground that is deſigned to be planted muſt be treated. And remark, that when the young ſhoots appear, another ſpit of mould from the trenches ſhould be ſtrewed over the beds ſo as to cover the ſhoots; this will prevent the froſt from injuring them, encourage them to expand, and totally deſtroy the young weeds; and when the potatoes are taken up in the autumn, a careful perſon may turn the earth again into the trenches, ſo as to make the ſurface level; and it will be right to remark, that from the ſame ground a much better crop of potatoes may be obtained the following year.

For field planting, a good (if not the beſt) method is to dung the land, which ſhould be once ploughed previous thereto; and when it is ploughed a ſecond time, a careful perſon ſhould drop the potato plants before the plough in every third furrow at about eight or ten inches apart. Plants that are cut with two eyes are beſt for this purpoſe. The reaſon for planting them at ſo great a diſtance as every third furrow, is, that when the ſhoots appear, a horſe-hoe may go upon the two vacant furrows to keep them clean; and after they are thus hoed, they ſhould be moulded up in ridges; and if this crop be taken up about October or November, the land will be in excellent condition to receive a crop of wheat. Lands that are full of twitch or couch-graſs may be made clean by this method, as the horſe-hoeing is as good as a ſummer-fallow; and if, when the potatoes are taken up, women and children were to pick out ſuch filth, not any traces of it would remain; and by laying it on heaps and burning it, a quantity of aſhes would be produced for manure.

After ploughing, none ſhould ever dibble in potatoes, as the perſons who dibble, plant, or hoe them, will all tread the ground; by which means it will become ſo bound, that the young fibres cannot expand, as has been already obſerved. Good crops have indeed been obtained by ploughing the land twice, and dropping the plants in every other furrow, and by hand-hoeing and earthing them up afterwards as the gardeners do peaſe; but this method is not equal to the other.

Vacant places in hedge-rows might be grubbed and planted with potatoes, and a good crop might be expected, as the leaves of trees, thorns, &c. are a good manure, and will ſurpriſingly encourage their growth, and gratify the wiſhes of the planter; who by cultivating ſuch places, will then make the moſt of his ground, and it will be in fine order to receive a crop of corn the following year.

164 Method of culture, &c. for which a premium was granted.

Account of the culture, expences, and produce of ſix acres of potatoes, being a fair part of near 70 acres, raiſed by John Billingſley, Eſq; and for which the premium was granted him in the year 1784.

EXPENCES.	L.	s.	d.
Plowing an oat-ſtubble in October 1783, at 4s. per acre - -	1	4	0
Croſs-ploughing in March 1784 -	1	4	0
Harrowing, 2s. per acre -	0	12	0
180 cart-loads of compoſt, 3l. per acre	18	0	0
42 ſacks of ſeed-potatoes (each ſack weighing 240 lb.) of the white ſort -	10	10	0
Cutting the ſets, 6d. per ſack -	1	1	0
Setting on ridges eight feet wide (leaving an interval of two feet for an alley) 6d. for every 20 yards - -	10	12	0
Hoeing, at 5s. per acre - -	1	10	0
Digging up the two feet interval, and throwing the earth on the plants, at 10s. per acre - - -	3	0	0
Digging up the crop, at 8d. for every 20 yards in length, the breadth being 8 feet	14	6	0
Labour and expence of ſecuring in pits, wear and tear of baſkets, ſtraw, reed, ſpikes, &c. 10s. per acre -	3	0	0
Rent - - -	6	0	0
Tithe - - -	1	10	0
	72	9	0
Profit - - -	73	11	0
	L. 146	0	0

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Produce.	L.	s.	d.
600 facks of beft potatoes at 4s.	120	0	0
120 facks middle-fized, 3s. 6d.	21	0	0
50 of fmall, 2s.	5	0	0
N. B. Each fack 240 lb.			
	L. 146	0	0

The field on which the above experiment was made, was an oat-ftubble in the autumn of 1783. In October it was ploughed, and left in a rough ftate during the winter. In April it was crofs-ploughed and harrowed. On the 8th of May the field was marked out into beds or ridges eight feet wide, leaving a fpace of two feet wide for an alley between every two ridges. The manure (a compoft of ftable dung, virgin earth, and fcrapings of a turnpike road) was then brought on the land, and depofited in fmall heaps on the centre of each ridge, in the proportion of about 30 cart-loads to each acre. A trench was then opened with a fpade, breadth-way of the ridge, about four inches deep; in this trench the potato-fets were placed, at the diftance of nine inches from each other; the dung was then fpread in a trench on the fets, and a fpace or plit of 14 inches in breadth, dug in upon them. When the plants were about fix inches high, they were carefully hoed, and foon after the two feet intervals between the ridges were dug, and the contents thrown around the young plants. This refrefhment, added to the ample manuring previoufly beftowed, produced fuch a luxuriance and rapidity of growth, that no weed could fhow its head.

165 Beft method of taking them up.

The fhorteft and moft certain method of taking up potatoes, is to plough once round every row at the diftance of four inches, removing the earth from the plants, and gathering up with the hand all the potatoes that appear. The diftance is made four inches, to prevent cutting the roots, which are feldom found above that diftance from the row on each fide. When the ground is thus cleared by the plough, raife the potatoes with a fork having three broad toes or claws; which is better than a fpade, as it does not cut the potatoes. The potatoes thus laid above ground muft be gathered with the hand. By this method fcarce a potato will be left.

166 Of preferving them.

As potatoes are a comfortable food for the low people, it is of importance to have them all the year round. For a long time, potatoes in Scotland were confined to the kitchen-garden; and after they were planted in the field, it was not imagined at firft that they could be ufed after the month of December. Of late years, they have been found to anfwer even till April; which has proved a great fupport to many a poor family, as they are eafily cooked, and require neither kiln nor mill. But there is no caufe for ftopping there. It is eafy to preferve them till the next crop: When taken out of the ground, lay in the corner of a barn a quantity that may ferve till April, covered from froft with dry ftraw preffed down: bury the remainder in a hole dug in dry ground, mixed with the hufks of dried oats, fand, or the dry leaves of trees, over which build a ftack of hay or corn. When the pit is opened for taking out the potatoes, the eyes of what have a tendency to pufh muft be cut out; and this cargo will ferve all the month of June. To be ftill more certain of making the old crop meet the new, the fetting of a fmall quantity may be delayed till June, to be taken up at the ordinary time before froft. This cargo, having not arrived to full growth, will not be fo ready to pufh as what are fet in April.

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If the old crop happen to be exhaufted before the new crop is ready, the interval may be fupplied by the potatoes of the new crop that lie next the furface, to be picked up with the hand; which, far from hurting the crop, will rather improve it.

3. Carrot and Parsnip.

Of all roots, a carrot requires the deepeft foil. It ought at leaft to be a foot deep, all equally good from top to bottom. If fuch a foil be not in the farm, it may be made artificially by trench-ploughing, which brings to the furface what never had any communication with the fun or air. When this new foil is fufficiently improved by a crop or two with dung, it is fit for bearing carrots. Beware of dunging the year when the carrots are fown; for with frefh dung they feldom efcape rotten fcabs. 167 Culture of carrot.

The only foils proper for that root, are a loam and a fandy foil.

The ground muft be prepared by the deepeft furrow that can be taken, the fooner after harveft the better; immediately upon the back of which, a ribbing ought to fucceed, as directed for barley. At the end of March, or beginning of April, which is the time of fowing the feed, the ground muft be fmoothed with a brake. Sow the feed in drills, with intervals of a foot for hand-hoeing: which is no expenfive operation where the crop is confined to an acre or two: but if the quantity of ground be greater, the intervals ought to be three feet, in order for horfe-hoeing.

In flat ground without ridges, it may be proper to make parallel furrows with the plough, ten feet from each other, in order to carry off any redundant moifture.

At Parlington in Yorkfhire, from the end of September to the firft of May, 20 work-horfes, four bullocks, and fix milk-cows, were fed on the carrots that grew on three acres; and thefe animals never tafted any other food but a little hay. The milk was excellent: and, over and above, 30 hogs were fattened upon what was left by the other beafts. We have this fact from undoubted authority.

The culture of parfnips is the fame with that of carrots. 168 Parfnips.

III. Plants cultivated for Leaves, or for both Leaves and *Root*.

There are many garden-plants of thefe kinds. The plants proper for the field are cabbage red and white, colewort plain and curled, turnip-rooted cabbage, and the root of fcarcity.

1. Cabbage is an interefting article in hufbandry. It is eafily raifed, is fubject to few difeafes, refifts froft more than turnip, is palatable to cattle, and fooner fills them than turnip, carrot, or potatoes. 169 Culture of cabbage.

The feafon for fetting cabbage depends on the ufe it is intended for. If intended for feeding in November, December, and January, plants procured from feed fown the end of July the preceding year muft be fet in March or April. If intended for feeding in March, April, and May, the plants muft be fet the firft week

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And now to prepare a field for cabbage. Where the plants are to be fet in March, the field muft be made up after harveft, in ridges three feet wide. In that form let it lie all winter, to be mellowed with air and froft. In March, take the firft opportunity, between wet and dry, to lay dung in the furrows. Cover the dung with a plough, which will convert the furrow into a crown, and confequently the crown into a furrow. Set the plants upon the dung, diftant from each other three feet. Plant them fo as to make a ftraight line crofs the ridges, as well as along the furrows, to which a gardener's line ftretched perpendicularly crofs the furrows will be requifite. This will fet each plant at the diftance precifely of three feet from the plants that furround it. The purpofe of this accuracy is to give opportunity for ploughing, not only along the ridges, but crofs them. This mode is attended with three fignal advantages: it faves hand-hoeing, it is a more complete dreffing to the foil, and it lays earth neatly round every plant.

If the foil be deep and compofed of good earth, a trench-ploughing after the preceding crop will not be amifs; in which cafe, the time for dividing the field into three-feet ridges, as above, ought to be immediately before the dunging for the plants.

If weeds happen to rife fo clofe to the plants as not to be reached by the plough, it will require very little labour to deftroy them with a hand-hoe.

Unlefs the foil be much infefted with annuals, twice ploughing after the plants are fet will be a fufficient dreffing. The firft removes the earth from the plants; the next, at the diftance of a month or fo, lays it back.

Where the plants are to be fet in July, the field muft be ribbed as directed for barley. It ought to have a flight ploughing in June before the planting, in order to loofen the foil, but not fo as to bury the furface-earth; after which the three feet ridges muft be formed, and the other particulars carried on as directed above with refpect to plants that are to be fet in March.

170 Cultivation of the turnip-rooted cabbages.

2. As to the *turnip-rooted cabbages*, their importance and value feem only to have been lately afcertained. In the Bath Society Papers we have the following account of Sir Thomas Beevor's method of cultivating them; which from experience he found to be cheaper and better than any other.

"In the firft or fecond week of June, I fow the fame quantity of feed, hoe the plants at the fame fize, leave them at the fame diftance from each other, and treat them in all refpects like the common turnip. In this method I have always obtained a plentiful crop of them; to afcertain the value of which I need only inform you, that on the 23d day of April laft, having then two acres left of my crop, found, and in great perfection, I divided them by fold hurdles into three parts of nearly equal dimenfions. Into the firft part I put 24 fmall bullocks of about 30 ftone weight each (14 lb. to the ftone), and 30 middle-fized fat wethers, which, at the end of the firft week, after they had eaten down the greater part of the leaves, and fome part of the roots, I fhifted into the fecond divifion, and then put 70 lean fheep into what was left of the firft; thefe fed off the remainder of the turnips left by the fat ftock; and fo they were fhifted through the three divifions, the lean ftock following the fat as they wanted food, until the whole was confumed.

171 Their utility and value.

"The 24 bullocks and 30 fat wethers continued in the turnips until the 21ft of May, being exactly four weeks; and the 70 lean fheep until the 29th, which is one day over four weeks: fo that the two acres kept me 24 fmall bullocks and 110 fheep four weeks (not reckoning the overplus day of keeping the lean fheep); the value, at the rate of keeping at that feafon, cannot be eftimated in any common year at lefs than 4d. a-week for each fheep, and 1s. 6d. per week for each bullock, which would amount together to the fum of L. 14 : 10 : 8 for the two acres.

"You will hardly, I conceive, think I have fet the price of keeping the ftock at too high a rate; it is beneath the price here in almoft every fpring, and in this laft it would have coft double, could it have been procured; which was fo far from being the cafe, that hundreds of fheep and lambs here were loft, and the reft greatly pinched for want of food.

"You will obferve, gentlemen, that in the valuation of the crop above mentioned I have claimed no allowance for the great benefit the farmer receives by being enabled to fuffer his grafs to get into a forward growth, nor for the fuperior quality of thefe turnips in fattening his ftock; both which circumftances muft ftamp a new and a great additional value upon them. But as their continuance on the land may feem to be injurious to the fucceeding crop, and indeed will deprive the farmer totally of either oats or barley; fo to fupply that lofs I have always fown buck-wheat on the firft earth upon the land from which the turnips were thus fed off; allowing one bufhel of feed per acre, for which I commonly receive from five to fix quarters per acre in return. And that I may not throw that part of my land out of the fame courfe of tillage with the reft, I fow my clover or other grafs-feeds with the buck-wheat, in the fame manner as with the oat or barley crops, and have always found as good a *layer* (ley) of it afterwards.

"Thus you fee, that in providing a moft incomparable vegetable food for cattle, in that feafon of the year in which the farmer is generally moft diftreffed, and his cattle almoft ftarved, a confiderable profit may likewife be obtained, much beyond what is ufually derived from his former practice, by the great produce and price of a crop raifed at fo eafy an expence as that of buck-wheat, which, with us, fells commonly at the fame price as barley, oftentimes more, and but very rarely for lefs.

"The land on which I have ufually fown turnip-rooted cabbages is a dry mixed foil, worth 15s. per acre."

To the preceding account the Society have fubjoined the following note: "Whether we regard the importance

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portance of the subject, or the clear and practical information which the foregoing letter conveys, it may be considered as truly interesting as any we have ever been favoured with: and therefore it is recommended in the strongest manner to farmers in general, that they adopt a mode of practice so decisively ascertained to be in a high degree judicious and profitable."

172 Recommendation by the Bath Society.

To raise the turnip-rooted cabbage for transplanting, the best method yet discovered is, to breast-plough and burn as much old pasture as may be judged necessary for the seed-bed; two perch well stocked with plants will be sufficient to plant an acre. The land should be dug as shallow as possible, turning the ashes in; and the seed should be sown the beginning of April.

173 To raise the turnip-rooted cabbage for transplanting.

The land intended for the plantation to be cultivated and dunged as for the common turnip. About Midsummer (or sooner if the weather will permit) will be a proper time for planting, which is best done in the following manner: the land to be thrown into *one-bout* ridges, upon the tops of which the plants are to be set, at about 18 inches distance from each other. As soon as the weeds rise, give a hand-hoeing, afterwards run the ploughs in the intervals, and fetch a furrow from each ridge, which, after laying a fortnight or three weeks, is again thrown back to the ridges; if the weeds rise again, it is necessary to give them another hand-hoeing.

If the young plants in the seed-bed should be attacked by the fly, sow wood-ashes over them when the dew is on, which will effectually prevent the ravages they would otherwise make.

174 Culture of the root of scarcity.

3. The *racine de disette*, or root of scarcity, (*Betacicla*) delights in a rich loamy land well dunged. It is directed to be sown in rows, or broad-cast, and as soon as the plants are of the size of a goose-quill, to be transplanted in rows of 18 inches distance, and 18 inches a part, one plant from the other: care must be taken in the sowing, to sow very thin, and to cover the seed, which lays in the ground about a month, an inch only.—In transplanting, the root is not to be shortened, but the leaves cut at the top; the plant is then to be planted with a setting-stick, so that the upper part of the root shall appear about half an inch out of the ground; this last precaution is very necessary to be attended to. These plants will strike root in twenty-four hours, and a man a little accustomed to planting, will plant with ease 1800 or 2000 a-day. In the seed-bed, the plants, like all others, must be kept clear of weeds: when they are planted out, after once hoeing, they will take care of themselves, and suffocate every kind of weed near them.

The best time to sow the seed is from the beginning of March to the middle of April: it is, however, advised to continue sowing every month until the beginning of July, in order to have a succession of plants. Both leaves and roots have been extolled as excellent both for man and beast. This plant is said not to be liable, like the turnip, to be destroyed by insects, for no insect touches it, nor is it affected by excessive drought, or the changes of seasons. Horned cattle, horses, pigs, and poultry, are exceedingly fond of it when cut small. The leaves may be gathered every 12 or 15 days; they are from 30 to 40 inches long, by 22 to 25 inches broad. This plant is excellent for milch cows, when given to them in proper proportions, as it adds much to the quality as well as quantity of their milk; but care must be taken to proportion the leaves with other green food, otherwise it would abate the milk, and fatten them too much, it being of so exceeding a fattening quality. To put all these properties beyond doubt, however, further experiments are wanting.

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Sect. IV. *Culture of Grass.*

The latter end of August, or the beginning of September, is the best season for sowing grass-seeds, as there is time for the roots of the young plants to fix themselves before the sharp frosts set in. It is scarce necessary to say, that moist weather is best for sowing; the earth being then warm, the seeds will vegetate immediately; but if this season prove unfavourable, they will do very well the middle of March following.

175 Of laying down fields to grass.

If you would have fine pasture, never sow on foul land. On the contrary, plough it well, and clear it from the roots of couch-grass, rest harrow, fern, broom, and all other noxious weeds. If these are suffered to remain, they will soon get above, and destroy your young grass. Rake these up in heaps, and burn them on the land, and spread the ashes as a manure. These ploughings and harrowings should be repeated in dry weather. And if the soil be clayey and wet, make some under-drains to carry off the water, which, if suffered to remain, will not only chill the grass, but make it sour. Before sowing, lay the land as level and fine as possible. If your grass-seeds are clean, (which should always be the case) three bushels will be sufficient per acre. When sown, harrow it in gently, and roll it in with a wooden roller. When it comes up, fill up all the bare spots by fresh seed, which, if rolled to fix it, will soon come up, and overtake the rest.

In Norfolk they sow clover with their grasses, particularly with rye-grass; but this should not be done except when the land is designed for grass only three or four years, because neither of these kinds will last long in the land. Where you intend it for a continuance, it is better to mix only small white Dutch clover, or marle grass, with your other grass feed, and not more than eight pounds to an acre. These are abiding plants, spread close on the surface, and make the sweetest feed of any for cattle. In the following spring, root up thistles, hemlock, or any large plants that appear. The doing this while the ground is soft enough to permit your drawing them by the roots, and before they seed, will save you infinite trouble afterwards.

The common method of proceeding in laying down fields to grass is extremely injudicious. Some sow barley with their grasses, which they suppose to be useful in shading them, without considering how much the corn draws away the nourishment from the land.

Others take their seeds from a foul hay-rick; by which means, besides filling the land with rubbish and weeds, what they intend for dry soils may have come from moist, where it grew naturally, and *vice versa*. The consequence is, that the ground, instead of being covered with a good thick sward, is filled with plants unnatural to it. The kinds of grass most eligible for pasture-lands are, the annual-meadow, creeping, and fine bent, the fox-tails, and crested dog's-tail, the poas, the fescues, the vernal, oat-

176 Different kinds of grass.

grass,

Practice. grafs, and the ray, or rye-grafs. We do not, however, approve of fowing all thefe kinds together; for not to mention their ripening at different times, by which means you can never cut them all in perfection and full vigour, no kind of cattle are fond of all alike.

Horfes will fcarcely eat hay which oxen and cows will thrive upon; fheep are particularly fond of fome kinds, and refufe others. The Darnel-grafs, if not cut before feveral of the other kinds are ripe, becomes fo hard and wiry in the ftalks, that few cattle care to eat it.

Such gentlemen as wifh a particular account of the above-mentioned graffes, will be amply gratified in confulting Mr Stillingfleet on this fubject. He has treated it with great judgment and accuracy, and thofe who follow his directions in the choice of their graffes will be under no fmall obligation to him for the valuable information he has given them. The fubftance of his obfervations are given in the article GRASSES in this Dictionary.

The graffes commonly fown for pafture, for hay, or to cut green for cattle, are red clover, white clover, yellow clover, rye-grafs, narrow-leaved plaintain commonly called *ribwort*, faintfoin, and lucerne.

Red clover is of all the moft proper to be cut green for fummer-food. It is a biennial plant when fuffered to perfect its feed; but when cut green, it will laft three years, and in a dry foil longer. At the fame time the fafeft courfe is to let it ftand but a fingle year: if the fecond year's crop happen to be fcanty, it proves, like a bad crop of peafe, a great encourager of weeds by the fhelter it affords them.

Here, as in all other crops, the goodnefs of feed is of importance. Choofe plump feed of a purple colour, becaufe it takes on that colour when ripe. It is red when hurt in the drying, and of a faint colour when unripe.

177 Of red clover.

Red clover is luxuriant upon a rich foil, whether clay, loam, or gravel: it will grow even upon a moor, when properly cultivated. A wet foil is its only bane; for there it does not thrive.

To have red clover in perfection, weeds muft be extirpated, and ftones taken off. The mould ought to be made as fine as harrowing can make it; and the furface be fmoothed with a light roller, if not fufficiently fmooth without it. This gives opportunity for diftributing the feed evenly: which muft be covered by a fmall harrow with teeth no larger than that of a garden-rake, three inches long, and fix inches afunder*. In harrowing, the man fhould walk behind with a rope in his hand fixed to the back part of the harrow, ready to difentangle it from ftones, clods, turnip or cabbage-roots, which would trail the feed, and difplace it.

* Plate V. fig. 7.

Nature has not determined any precife depth for the feed of red clover more than of other feed. It will grow vigoroufly from two inches deep, and it will grow when barely covered. Half an inch may be reckoned the moft advantageous pofition in clay foil, a whole inch in what is light or loofe. It is a vulgar error, that fmall feed ought to be fparingly covered. Mifled by that error, farmers commonly cover their clover-feed with a bufhy branch of thorn; which not only covers it unequally, but leaves part on the furface to wither in the air.

The proper feafon for fowing red-clover, is from the middle of April to the middle of May. It will fpring from the firft of March to the end of Auguft; but fuch liberty ought not to be taken except from neceffity.

There cannot be a greater blunder in hufbandry, than to be fparing of feed. Ideal writers talk of fowing an acre with four pounds. That quantity of feed, fay they, will fill an acre with plants as thick as they ought to ftand. This rule may be admitted where grain is the object; but it will not anfwer with refpect to grafs. Grafs-feed cannot be fown too thick: the plants fhelter one another: they retain all the dew: and they muft pufh upward, having no room laterally. Obferve the place where a fack of peafe, or of other grain, has been fet down for fowing: the feed dropt there accidentally grows more quickly than in the reft of the field fown thin out of hand. A young plant of clover, or of faintfoin, according to Tull, may be raifed to a great fize where it has room; but the field will not produce half the quantity. When red clover is fown for cutting green, there ought not to be lefs than 24 pounds to an acre. A field of clover is feldom too thick: the fmaller a ftem be, the more acceptable it is to cattle. It is often too thin; and when fo, the ftems tend to wood.

178 Of fowing clover with grain.

Red clover is commonly fown with grain; and the moft proper grain has been found by experience to be flax. The foil muft be highly cultivated for flax as well as for red clover. The proper feafon of fowing is the fame for both; the leaves of flax being very fmall, admit of free circulation of air; and flax being an early crop, is removed fo early as to give the clover time for growing. In a rich foil it has grown fo faft, as to afford a good cutting that very year. Next to flax, barley is the beft companion to clover. The foil muft be loofe and free for barley; and fo it ought to be for clover: the feafon of fowing is the fame; and the clover is well eftablifhed in the ground, before it is overtopped by the barley. At the fame time, barley commonly is fooner cut than either oats or wheat. In a word, barley is rather a nurfe than a ftepmother to clover during its infancy. When clover is fown in fpring upon wheat, the foil, which has lain five or fix months without being ftirred, is an improper bed for it; and the wheat, being in the vigour of growth, overtops it from the beginning. It cannot be fown along with oats, becaufe of the hazard of froft; and when fown as ufual among the oats three inches high, it is over-topped, and never enjoys free air till the oats be cut. Add, that where oats are fown upon the winter-furrow, the foil is rendered as hard as when under wheat.—Red clover is fometimes fown by itfelf without other grain: but this method, befide lofing a crop, is not falutary; becaufe clover in its infant ftate requires fhelter.

As to the quantity of grain proper to be fown with clover: In a rich foil well pulverized, a peck of barley on an Englifh acre is all that ought to be ventured; but there is not much foil in Scotland fo rich. Two Linlithgow firlots make the proper quantity for an acre that produces commonly fix bolls of barley; half a firlot for what produces nine bolls. To thofe who are governed by cuftom, fo fmall a quantity will be thought ridiculous. Let them only confider, that a rich foil in perfect good order, will from a fingle feed of

of barley produce 20 or 30 vigorous ſtems. People may flatter themſelves with the remedy of cutting barley green for food, if it happen to oppreſs the clover. This is an excellent remedy in a field of an acre or two; but the cutting an extenſive field for food muſt be ſlow; and while one part is cutting, the clover is ſmothered in other parts.

179 White and yellow clover, ribwort, and rye-graſs.

The culture of white clover, of yellow clover, of ribwort, of rye-graſs, is the ſame in general with that of red clover. We proceed to their peculiarities. Yellow clover, ribwort, rye-graſs, are all of them early plants, blooming in the end of April or beginning of May. The two latter are evergreens, and therefore excellent for winter-paſture. Rye-graſs is leſs hurt by froſt than any of the clovers, and will thrive in a moiſter ſoil: nor in that ſoil is it much affected by drought. In a rich ſoil, it grows four feet high: even in the dry ſummer 1775, it roſe to three feet eight inches; but it had gained that height before the drought came on. Theſe graſſes are generally ſown with red clover for producing a plentiful crop. The proportion of ſeed is arbitrary; and there is little danger of too much. When rye-graſs is ſown for procuring ſeed, five firlots wheat-meaſure may be ſown on an acre; and for procuring ſeed of ribwort, 40 pounds may be ſown. The roots of rye-graſs ſpread horizontally: they bind the ſoil by their number; and tho' ſmall, are yet ſo vigorous as to thrive in hard ſoil. Red clover has a large tap-root, which cannot penetrate any ſoil but what is open and free; and the largeneſs of the root makes the ſoil ſtill more open and free. Rye-graſs, once a great favourite, appears to be diſcarded in moſt parts of Britain. The common practice has been, to ſow it with red clover, and to cut them promiſcuouſly the beginning of June for green food, and a little later for hay. This indeed is the proper ſeaſon for cutting red clover, becauſe at that time it begins to flower; but as at that time the ſeed of the rye-graſs is approaching to maturity, its growth is ſtopped for that year, as much as of oats or barley cut after the ſeed is ripe. Oats or barley cut green before the ſeed forms, will afford two other cuttings; which is the caſe of rye-graſs, of yellow clover, and of ribwort. By ſuch management, all the profit will be drawn that theſe plants can afford.

When red clover is intended for ſeed, the ground ought to be cleared of weeds, were it for no other purpoſe than that the ſeed cannot otherwiſe be preſerved pure: what ſeeds eſcape the plough ought to be taken out by the hand. In England, when a crop of ſeed is intended, the clover is always firſt cut for hay. This appears to be done, as in fruit-trees, to check the growth of the wood, in order to encourage the fruit. This practice will not anſwer in Scotland, as the ſeed would often be too late for ripening. It would do better to eat the clover with ſheep till the middle of May, which would allow the ſeed to ripen. The ſeed is ripe when, upon rubbing it between the hands, it parts readily from the huſk. Then apply the ſcythe, ſpread the crop thin, and turn it carefully. When perfectly dry, take the firſt opportunity of a hot day for threſhing it on boards covered with a coarſe ſheet. Another way leſs ſubject to riſk, is to ſtack the dry hay, and to threſh it in the end of April. After the firſt threſhing, expoſe the huſks to the ſun, and threſh them over and over till no ſeed remain. Nothing is more efficacious than a hot ſun to make the huſk part with its ſeed; in which view it may be expoſed to the ſun by parcels, an hour or two before the flail is applied.

White clover, intended for ſeed, is managed in the ſame manner. No plant ought to be mixed with rye-graſs that is intended for ſeed. In Scotland, much rye-graſs ſeed is hurt by tranſgreſſing that rule. The ſeed is ripe when it parts eaſily with the huſk. The yellowneſs of the ſtem is another indication of its ripeneſs; in which particular it reſembles oats, barley, and other culmiferous plants. The beſt manner to manage a crop of rye-graſs for ſeed, is to bind it looſely in ſmall ſheaves, widening them at the bottom to make them ſtand erect; as is done with oats in moiſt weather. In that ſtate they may ſtand till ſufficiently dry for threſhing. By this method they dry more quickly, and are leſs hurt by rain, than by cloſe binding and putting the ſheaves in ſhocks like corn. The worſt way of all is to ſpread the rye-graſs on the moiſt ground, for it makes the ſeed malten. The ſheaves, when ſufficiently dry, are carried into cloſe carts to where they are to be threſhed on a board, as mentioned above for clover. Put the ſtraw in a rick when a hundred ſtone or ſo are threſhed. Carry the threſhing-board to the place where another rick is intended; and ſo on till the whole ſeed be threſhed, and the ſtraw ricked. There is neceſſity for cloſe carts to ſave the ſeed, which is apt to drop out in a hot ſun; and, as obſerved above, a hot ſun ought always to be choſen for threſhing. Carry the ſeed in ſacks to the granary or barn, there to be ſeparated from the huſks by a fanner. Spread the ſeed thin upon a timber-floor, and turn it once or twice a-day till perfectly dry. If ſuffered to take a heat, it is uſeleſs for ſeed.

180 Culture of ſainfoin.

The writers on agriculture reckon ſainfoin preferable to clover in many reſpects: They ſay, that it produces a larger crop; that it does not hurt cattle when eaten green; that it makes better hay; that it continues four times longer in the ground; and that it will grow on land that will bear no other crop.

Sainfoin has a very long tap-root, which is able to pierce very hard earth. The roots grow very large; and the larger they are, they penetrate to the greater depth; and hence it may be concluded, that this graſs, when it thrives well, receives a great part of its nouriſhment from below the *ſtaple* of the ſoil: of courſe, a deep dry ſoil is beſt for the culture of ſainfoin. When plants draw their nouriſhment from that part of the ſoil that is near the ſurface, it is not of much conſequence whether their number be great or ſmall. But the caſe is very different when the plants receive their food, not only near, but alſo deep below, the ſurface. Beſides, plants that ſhoot their roots deep are often ſupplied with moiſture, when thoſe near the ſurface are parched with drought.

To render the plants of ſainfoin vigorous, it is neceſſary that they be ſown thin. The beſt method of doing this is by a drill; becauſe, when ſown in this manner, not only the weeds, but alſo the ſupernumerary plants, can eaſily be removed. It is ſeveral years before ſainfoin comes to its full ſtrength; and the number of plants ſufficient to ſtock a field, while in this imperfect ſtate, will make but a poor crop for the firſt year or two. It is therefore neceſſary that it be ſown in ſuch a manner as to make it eaſy to take up plants

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in ſuch numbers, and in ſuch order, as always to leave in the field the proper number in their proper places. This can only be done, with propriety, by ſowing the plants in rows by a drill. Suppoſing a field to be drilled in rows at ten inches diſtance, the partitions may be hand-hoed, and the rows dreſſed in ſuch a manner as to leave a proper number of plants. In this ſituation the field may remain two years; then one-fourth of the rows may be taken out in pairs, in ſuch a manner as to make the beds of fifty inches, with ſix rows in each, and intervals of thirty inches, which may be ploughed. Next year, another fourth of the rows may be taken out in the ſame manner, ſo as to leave double rows with partitions of ten inches, and intervals of thirty: All of which may be hoed at once or alternately, as it may be found moſt convenient.

The great quantity of this graſs which the writers on this ſubject aſſure us may be raiſed upon an acre, and the excellency and great value of the hay made of it, ſhould induce farmers to make a complete trial of it, and even to uſe the ſpade in place of the hoe, or hoe-plough, if neceſſary.

The plants taken up from a field of ſainfoin may be ſet in another field; and if the tranſplanting of this graſs ſucceeds as well as the tranſplanting of lucerne has done with Mr Lunin de Chateauvieux, the trouble and expence will be ſufficiently recompenſed by the largeneſs of the crops. In tranſplanting, it is neceſſary to cut off great part of the long tap-root: this will prevent it from ſtriking very deep into the ſoil, and make it puſh out large roots in a ſloping direction from the cut end of the tap-root. Sainfoin managed in this manner, will thrive even on ſhallow land that has a wet bottom, provided it be not overſtocked with plants.

Whoever inclines to try the culture of this graſs in Scotland, ſhould take great pains in preparing the land, and making it as free from weeds as poſſible.

In England, as the roots ſtrike deep in that chalky ſoil, this plant is not liable to be ſo much injured by drought as other graſſes are, whoſe fibres lie horizontally, and lie near the ſurface. The quantity of hay produced is greater and better in quality than any other. But there is one advantage attending this graſs, which renders it ſuperior to any other; and that ariſes from feeding with it milch cows. The prodigious increaſe of milk which it makes is aſtoniſhing, being nearly double that produced by any other green food. The milk is alſo better, and yields more cream than any other; and the butter procured from it much better coloured and flavoured.

181 Remarks on the culture of ſainfoin in England.

The following remarks by an Engliſh farmer are made from much experience and obſervation.

Sainfoin is much cultivated in thoſe parts where the ſoil is of a chalky kind. It will always ſucceed well where the roots run deep; the worſt ſoil of all for it is where there is a bed of cold wet clay, which the tender fibres cannot penetrate. This plant will make a greater increaſe of produce, by at leaſt 30 times, than common graſs or turf on poor land. Where it meets with chalk or ſtone, it will extend its roots through the cracks and chinks to a very great depth in ſearch of nouriſhment. The dryneſs is of more conſequence than the richneſs of land for ſainfoin; although land that is both dry and rich will always produce the largeſt crops.

It is very commonly ſowed broadcaſt; but it is found to anſwer beſt in drills, eſpecially if the land be made fine by repeated ploughing, rolling, and harrowing. Much depends on the depth which this ſeed is ſown. If it be buried more than an inch deep, it will ſeldom grow; and if left uncovered, it will puſh out its roots above ground, and theſe will be killed by the air. March and the beginning of April are the beſt ſeaſons for ſowing it, as the ſeverity of winter and the drought of ſummer are equally unfavourable to the young plants. A buſhel of ſeed ſown broadcaſt, or half that quantity in drills, if good, is ſufficient for an acre. The drills ſhould be 30 inches apart, to admit of horſe-hoeing between them. Much, however, depends on the goodneſs of the ſeed, which may be beſt judged of by the following marks.

The huſk being of a bright colour, the kernel plump, of a grey or bluiſh colour without, and, if cut acroſs, greeniſh and freſh withinſide; if it be thin and furrowed, and of a yellowiſh caſt, it will ſeldom grow. When the plants ſtand ſingle, and have room to ſpread, they produce the greateſt quantity of herbage, and the ſeed ripens beſt. But farmers in general, from a miſtaken notion of all that appears to be waſte ground being unprofitable, plant them ſo cloſe, that they choke and impoveriſh each other, and often die in a few years. Single plants run deepeſt and draw moſt nouriſhment; they are alſo eaſieſt kept free from weeds. A ſingle plant will often produce half a pound of hay, when dry. On rich land this plant will yield two good crops in a year, with a moderate ſhare of culture. A good crop muſt not be expected the firſt year; but, if the plants ſtand not too thick, they will increaſe in ſize the ſecond year prodigiouſly.

No cattle ſhould be turned on the field the firſt winter after the corn is off with which it was ſown, as their feet would injure the young plants. Sheep ſhould not come on the following ſummer, becauſe they would bite off the crown of the plants, and prevent their ſhooting again. A ſmall quantity of ſoapers aſhes as a top-dreſſing will be of great ſervice, if laid on the firſt winter.

If the ſainfoin be cut juſt before it comes into bloom, it is admirable food for horned cattle; and if cut thus early, it will yield a ſecond crop the ſame ſeaſon. But if it proves a wet ſeaſon, it is better to let it ſtand till its bloom be perfected; for great care muſt be taken, in making it into hay, that the flowers do not drop off, as cows are very fond of them; and it requires more time than other hay in drying. Sainfoin is ſo excellent a fodder for horſes, that they require no oats while they eat it, although they be worked hard all the time. Sheep will alſo be fattened with it faſter than with any other food.

If the whole ſeaſon for cutting proves very rainy, it is better to let the crop ſtand for ſeed, as that will amply repay the loſs of the hay; becauſe it will not only fetch a good price, but a peck of it will go as far as a peck and a half of oats for horſes.

The beſt time of cutting the ſeeded ſainfoin is, when the greateſt part of the ſeed is well filled, the firſt

blown

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182 Its excellence as food for cows.

An acre of very ordinary land, when improved by this graſs, will maintain four cows very well from the firſt of April to the end of November; and afford, beſides, a ſufficient ſtore of hay to make the greater part of their food the four months following.

If the ſoil be tolerably good, a field of ſainfoin will laſt from 15 to 20 years in prime; but at the end of ſeven or eight years, it will be neceſſary to lay on a moderate coat of well-rotted dung; or, if the ſoil be very light and ſandy, of marle. By this means the future crops, and the duration of the plants in health and vigour, will be greatly increaſed and prolonged. Hence it will appear, that for poor land there is nothing equal to this graſs in point of advantage to the farmer.

Clover will laſt only two years in perfection; and often, if the ſoil be cold and moiſt, near half the plants will rot, and bald patches be found in every part of the field the ſecond year. Beſides, from our frequent rains during the month of September, many crops left for ſeeding are loſt. But from the quantity and excellent quality of this graſs (ſainfoin), and its ripening earlier, and continuing in vigour ſo much longer, much riſk and certain expence is avoided, and a large annual profit accrues to the farmer.

183 Culture of lucerne.

The writers on agriculture, ancient as well as modern, beſtow the higheſt encomiums upon lucerne as affording excellent hay, and producing very large crops. Lucerne remains at leaſt 10 or 12 years in the ground, and produces about eight tons of hay upon the Scots acre. There is but little of it cultivated in Scotland. However, it has been tried in ſeveral parts of that country; and it is found, that, when the ſeed is good, it comes up very well, and ſtands the winter froſt. But the chief thing which prevents this graſs from being more uſed in Scotland, is the difficulty of keeping the ſoil open and free from weeds. In a few years the ſurface becomes ſo hard, and the turf ſo ſtrong, that it deſtroys the lucerne before the plants have arrived at their greateſt perfection: ſo that lucerne can ſcarce be cultivated with ſucceſs there, unleſs ſome method be fallen upon of deſtroying the natural graſs, and prevent the ſurface from becoming hard and impenetrable. This cannot be done effectually by any other means than horſe-hoeing. This method was firſt propoſed by Mr Tull, and afterwards practiſed ſucceſsfully by M. de Chateauvieux near Geneva. It may be of uſe therefore to give a view of that gentleman's method of cultivating lucerne.

He does not mention any thing particular as to the manner of preparing the land; but only obſerves in general, that no pains ſhould be ſpared in preparing it. He tried the ſowing of lucerne both in rows upon the beds where it was intended to ſtand, and likewiſe the ſowing it in a nurſery, and afterwards tranſplanting it into the beds prepared for it. He prefers tranſplanting; becauſe, when tranſplanted, part of the tap-root is cut off, and the plant ſhoots out a number of lateral branches from the cut part of the root, which makes it ſpread its roots nearer the ſurface, and conſequently renders it more eaſily cultivated: beſides, this circumſtance adapts it to a ſhallow ſoil, in which, if left in its natural ſtate, it would not grow. Practice.

The tranſplanting of lucerne is attended with many advantages. The land may be prepared in the ſummer for receiving the plants from the nurſery in autumn; by which means the field muſt be in a much better ſituation than if the ſeed had been ſown upon it in the ſpring. By tranſplanting, the rows can be made more regular, and the intended diſtances more exactly obſerved; and conſequently the hoeing can be performed more perfectly, and with leſs expence. Mr Chateauvieux likewiſe tried the lucerne in ſingle beds three feet wide, with ſingle rows; in beds three feet nine inches wide, with double rows; and in beds four feet three inches wide, with triple rows. The plants in the ſingle rows were ſix inches aſunder, and thoſe in the double and triple rows were about eight or nine inches. In a courſe of three years he found, that a ſingle row produced more than a triple row of the ſame length. The plants of lucerne, when cultivated by tranſplantation, ſhould be at leaſt ſix inches aſunder, to allow them room for extending their crowns.

He further obſerves, that the beds or ridges ought to be raiſed in the middle; that a ſmall trench, two or three inches deep, ſhould be drawn in the middle; and that the plants ought to be ſet in this trench, covered with earth up to the neck. He ſays, that if the lucerne be ſown in ſpring, and in a warm ſoil, it will be ready for tranſplanting in September; that, if the weather be too hot and dry, the tranſplanting ſhould be delayed till October; and that, if the weather be unfavourable during both theſe months, this operation muſt be delayed till ſpring. He further directs, that the plants ſhould be carefully taken out of the nurſery, ſo as not to damage the roots; that the roots be left only about ſix or ſeven inches long; that the green crops be cut off within about two inches of the crown; that they be put into water as ſoon as taken up, there to remain till they are planted; and that they ſhould be planted with a planting-ſtick, in the ſame manner as cabbages.

He does not give particular directions as to the times of horſe-hoeing; but only ſays in general, that the intervals ſhould be ſtirred once in the month during the whole time that the lucerne is in a growing ſtate. He likewiſe obſerves, that great care ought to be taken not to ſuffer any weeds to grow among the plants, at leaſt for the firſt two or three years; and for this purpoſe, that the rows, as well as the edges of the intervals where the plough cannot go, ſhould be weeded by the hand.

Burnet is peculiarly adapted to poor land; beſides, it proves an excellent winter-paſture when hardly any thing elſe vegetates. Other advantages are, It makes good butter; it never blows or ſwells cattle; it is fine paſture for ſheep; and will flouriſh well on poor, light, ſandy, or ſtony ſoils, or even on dry chalk hills. 184 Culture of burnet.

The cultivation of it is neither hazardous nor expen-

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five. If the land is prepared as is generally done for turnips, there is no danger of its failing. After the firſt year, it will be attended with very little expence, as the flat circular ſpread of its leaves will keep down, or prevent the growth of weeds.

On the failure of turnips, either from the fly or the black worm, ſome of our farmers have ſown the land with burnet, and in March following had a fine paſture for their ſheep and lambs. It will perfect its ſeed twice in a ſummer; and this ſeed is ſaid to be as good as oats for horſes; but it is too valuable to be applied to that uſe.

It is ſometimes ſown late in the ſpring with oats and barley, and ſucceeds very well; but it is beſt to ſow it ſingly in the beginning of July, when there is a proſpect of rain, on a ſmall piece of land, and in October following, tranſplant it in rows two feet apart, and about a foot diſtant in the rows. This is a proper diſtance, and gives opportunity for hoeing the intervals in the ſucceeding ſpring and ſummer.

After it is fed down with cattle, it ſhould be harrowed clean. Some horſes will not eat it freely at firſt, but in two or three days they are generally very fond of it. It affords rich pleaſant milk, and in great plenty.

A gentlemen farmer near Maidſtone ſome years ſince ſowed four acres as ſoon as the crop of oats were got off, which was the latter end of Auguſt. He threw in 12 pounds of ſeed per acre, broadcaſt; and no rain falling until the middle of September, the plants did not appear before the latter end of that month. There was however a good crop, and in the ſpring he ſet the plants out with a turnip-hoe, leaving them about a foot diſtant from each other. But the drill method is preferable, as it ſaves more than half the ſeed. The land was a poor dry gravel, not worth three ſhillings an acre for any thing elſe.

The ſevereſt froſt never injures this plant; and the oftener it is fed the thicker are its leaves, which ſpring conſtantly from its root.

Sect. V. *Rotation of Crops.*

185 Rotation of crops.

No branch of huſbandry requires more ſkill and ſagacity than a proper rotation of crops, ſo as to keep the ground always in heart, and yet to draw out of it the greateſt profit poſſible. Some plants rob the ſoil, others are gentle to it: ſome bind, others looſen. The nice point is, to intermix crops, ſo as to make the greateſt profit conſiſtently with keeping the ground in trim. In that view, the nature of the plants employed in huſbandry muſt be accurately examined.

186 Culmiferous and leguminous plants.

The difference between culmiferous and leguminous plants, is occaſionally mentioned above*. With reſpect to the preſent ſubject, a cloſer inſpection is neceſſary. Culmiferous plants, having ſmall leaves and few in number, depend moſtly on the ſoil for nouriſhment, and little on the air. During the ripening of the ſeed, they draw probably their whole nouriſhment from the ſoil; as the leaves by this time, being dry and withered, muſt have loſt their power of drawing nouriſhment from the air. Now, as culmiferous plants are chiefly cultivated for their ſeed, and are not cut down till the ſeed be fully ripe, they may be pronounced all of them to be robbers, ſome more, ſome leſs. But ſuch plants, while young, are all leaves; and in that ſtate draw moſt of their nouriſhment from the air. Hence it is, that where cut green for food to cattle, a culmiferous crop is far from being a robber. A hay-crop accordingly, even where it conſiſts moſtly of rye-graſs, is not a robber, provided it be cut before the ſeed is formed; which at any rate it ought to be, if one would have hay in perfection. And the foggage, excluding the froſt by covering the ground, keeps the roots warm. A leguminous plant, by its broad leaves, draws much of its nouriſhment from the air. A cabbage, which has very broad leaves, and a multitude of them, owes its growth more to the air than to the ſoil. One fact is certain, that a cabbage cut and hung up in a damp place, preſerves its verdure longer than other plants. At the ſame time, a ſeed is that part of a plant which requires the moſt nouriſhment; and for that nouriſhment a culmiferous plant muſt be indebted entirely to the ſoil. A leguminous crop, on the contrary, when cut green for food, muſt be very gentle to the ground. Peaſe and beans are leguminous plants; but being cultivated for ſeed, they ſeem to occupy a middle ſtation: their ſeed makes them more ſevere than other leguminous crops cut green; their leaves, which grow till reaping, make them leſs ſevere than a culmiferous plant left to ripen.

* N° 120, 121.

Theſe plants are diſtinguiſhed no leſs remarkably by the following circumſtance. All the ſeeds of a culmiferous plant ripen at the ſame time. As ſoon as they begin to form, the plant becomes ſtationary, the leaves wither, the roots ceaſe to puſh, and the plant when cut down is blanched and ſapleſs. The ſeeds of a leguminous plant are formed ſucceſſively: flowers and fruit appear at the ſame time in different parts of the plant. This plant accordingly is continually growing, and puſhing its roots. Hence the value of bean or peaſe ſtraw above that of wheat or oats: the latter is withered and dry when the crop is cut; the former, green and ſucculent. The difference therefore, with reſpect to the ſoil, between a culmiferous and leguminous crop, is great. The latter, growing till cut down, keeps the ground in conſtant motion, and leaves it to the plough looſe and mellow. The former gives over growing long before reaping; and the ground, by want of motion, turns compact and hard. Nor is this all. Dew falling on a culmiferous crop after the ground begins to harden, reſts on the ſurface, and is ſucked up by the next ſun. Dew that falls on a leguminous crop, is ſhaded from the ſun by the broad leaves, and ſinks at leiſure into the ground. The ground accordingly, after a culmiferous crop, is not only hard, but dry: after a leguminous crop, it is not only looſe, but ſoft and unctuous.

Of all culmiferous plants, wheat is the moſt ſevere, by the long time it occupies the ground without admitting a plough. And as the grain is heavier than that of barley or oats, it probably requires more nouriſhment than either. It is obſerved above, that as peaſe and beans draw part of their nouriſhment from the air by their green leaves while allowed to ſtand, they draw the leſs from the ground; and by their conſtant growing they leave it in good condition for ſubſequent crops. In both reſpects they are preferable to any culmiferous crop.

Culmiferous crops, as obſerved above, are not robbers when cut green: the ſoil, far from hardening, is kept

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Bulbous-rooted plants are above all successful in dividing and pulverizing the soil. Potato-roots grow six, eight, or ten inches under the surface; and, by their size and number, they divide and pulverize the soil better than can be done by the plough; consequently, whatever be the natural colour of the soil, it is black when a potato-crop is taken up. The potato, however, with respect to its quality of dividing the soil, must yield to a carrot or parsnip; which are large roots, and pierce often to the depth of 18 inches. The turnip, by its tap-root, divides the soil more than can be done by a fibrous-rooted plant; but as its bulbous root grows mostly above ground, it divides the soil less than the potato, the carrot, or the parsnip. Red clover, in that respect, may be put in the same class with turnip.

Whether potatoes or turnip be the more gentle crop, appears a puzzling question. The former bears seed, and probably draws more nourishment from the soil than the latter, when cut green. On the other hand, potatoes divide the soil more than turnip, and leave it more loose and friable. It appears no less puzzling, to determine between cabbage and turnip: the former draws more of its nourishment from the air, the latter leaves the soil more free and open.

The result of the whole is what follows: Culmiferous plants are robbers; some more, some less: they at the same time bind the soil; some more, some less. Leguminous plants in both respects are opposite: if any of them rob the soil, it is in a very slight degree; and all of them without exception loosen the soil. A culmiferous crop, however, is generally the more profitable: but few soils can long bear the burden of such crops, unless relieved by interjected leguminous crops. These, on the other hand, without a mixture of culmiferous crops, would soon render the soil too loose.

These preliminaries will carry the farmer some length in directing a proper rotation of crops. Where dung, lime, or other manure, can be procured in plenty to recruit the soil after severe cropping, no rotation is more proper or profitable in a strong soil, than wheat, pease or beans, barley, oats, fallow. The whole farm may be brought under this rotation, except so far as hay is wanted. But as such command of manure is rare, it is of more importance to determine what should be the rotation when no manure can be procured but the dung collected in the farm. Considering that culmiferous crops are the more profitable in rich land, it would be proper to make them more frequent than the other kind. But as there are few soils in Scotland that will admit such frequent culmiferous crops without suffering, it may be laid down as a general rule, that alternate crops, culmiferous and leguminous, ought to form the rotation. Nor are there many soils that will stand good, even with this favourable rotation, unless relieved from time to time by pasturing a few years. If such extended rotation be artfully carried on, crops without end may be obtained in a tolerable good soil, without any manure but what is produced in the farm.

It is scarce necessary to be mentioned, being known to every farmer that clay answers best for wheat, moist clay for beans, loam for barley and pease, light soil for turnip, sandy soil for rye and buck-wheat; and that oats thrive better in coarse soil than any other grain. Now, in directing a rotation, it is not sufficient that a culmiferous crop be always succeeded by a leguminous: attention must also be given, that no crop be introduced that is unfit for the soil. Wheat, being a great binder, requires more than any other crop a leguminous crop to follow. But every such crop is not proper: potatoes are the greatest openers of soil; but they are improper in a wheat soil. Neither will turnip answer, because it requires a light soil. A very loose soil, after a crop of rye, requires rye-grass to bind it, or the treading of cattle in pasturing: but to bind the soil, wheat must not be ventured; for it succeeds ill in loose soil.

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187 The nature of soil considered, with regard to the rotation of crops.

Another consideration of moment in directing the rotation, is to avoid crops that encourage weeds. Pease is the fittest of all crops for succeeding to wheat, because it renders the ground loose and mellow, and the same soil agrees with both. But beware of pease, unless the soil be left by the wheat perfectly free of weeds; because pease, if not an extraordinary crop, foster weeds. Barley may be ventured after wheat, if the farmer be unwilling to lose a crop. It is indeed a robber; better, however, any crop, than run the hazard of poisoning the soil with weeds. But to prevent the necessity of barley after wheat, the land ought to be fallowed before the wheat: it cleans the ground thoroughly, and makes pease a secure crop after wheat. And after a good crop of pease, barely never fails. A horse-hoed crop of turnip is equal to a fallow for rooting out weeds; but turnip does not suit land that is proper for wheat. Cabbage does well in wheat soil; and a horse-hoed crop of cabbage, which eradicates weeds, is a good preparation for wheat to be succeeded by pease; and a crop of beans diligently hand-hoed, is in that view little inferior. As red clover requires the ground to be perfectly clean, a good crop of it ensures wheat, and next pease. In loam, a drilled crop of turnip or potatoes prepares the ground, equal to a fallow, for the same succession.

Another rule is, to avoid a frequent repetition of the same species; for to produce good crops, change of species is no less necessary than change of seed. The same species returning every second or third year, will infallibly degenerate, and be a scanty crop. This is remarkably the case of red clover. Nor will our fields bear pleasantly perpetual crops of wheat after fallow, which is the practice of some English farmers.

Hitherto of rotation in the same field. We add one rule concerning rotation in different fields; which is, to avoid crowding crops one after another in point of time; but to choose such as admit intervals sufficient for leisurely dressing, which gives opportunity to manage all with the same hands, and with the same cattle; for example, beans in January or February, pease and oats in March, barley and potatoes in April, turnip in June or July, wheat and rye in October.

188 Exceptionable rotations.

For illustrating the foregoing rules, a few instances of exceptionable rotations will not be thought amiss. The following is an usual rotation in Norfolk. First, wheat after red clover. Secondly, barley. Third, turnip. Fourth, barley with red clover. Fifth, clover cut for hay. Sixth, a second year's crop of clover commonly

commonly pastured. Dung is given to the wheat and turnip.—Against this rotation several objections lie. Barley after wheat is improper. The two crops of barley are too near together. The second crop of clover must be very bad, if pasturing be the best way of consuming it; and if bad, it is a great encourager of weeds. But the strongest objection is, that red clover repeated so frequently in the same field cannot fail to degenerate; and of this the Norfolk farmers begin to be sensible.—Salton in East Lothian is a clay soil; and the rotation there is, Wheat after fallow and dung. Second, barley after two ploughings; the one before winter, the other immediately before the seed is sown. Third, oats. Fourth, pease. Fifth, barley. Sixth, oats: and then fallow. This rotation consists chiefly of robbing crops. Pease are the only leguminous crop, which even with the fallow is not sufficient to loosen a stiff soil. But the soil is good, which in some measure hides the badness of the rotation.—About Seaton, and all the way from Preston to Gosford, the ground is still more severely handled: wheat after fallow and dung, barley, oats, pease, wheat, barley, oats, and then another fallow. The soil is excellent; and it ought indeed to be so, to support many rounds of such cropping.

In the parishes of Tranent, Aberlady, Dirleton, North-Berwick, and Athelstonefoord, the following rotations were formerly universal, and to this day are much more frequent than any other mode.

1. After fallow with dung, wheat, barley, oats, pease and beans, barley, oats, wheat.

2. After fallow and dung, barley, oats, pease and beans, wheat, barley, oats pease, wheat.

3. After fallow and dung, wheat, oats, pease, barey, oats, wheat.

4. After fallow and dung, barley, oats, beans, wheat, pease, barley, oats.

In the several Tours of Young the itinerant farmer, are found, in the best counties of England, examples without end, of rotations no less exceptionable than many of those mentioned.

189 Fields not to be kept too long in pasture.

Where a field is laid down for pasture in order to be recruited, it is commonly left in that state many years; for it is the universal opinion, that the longer it lies, the richer it becomes for bearing corn. This may be true; but in order to determine the mode of cropping, the important point is, what upon the whole is the most profitable rotation; not what may produce luxuriant crops at a distant period. Upon that point, it may be affirmed, that the farmer who keeps a field in pasture beyond a certain time, loses every year considerably; and that a few luxuriant crops of corn, after 20 years of pasture, and still more after 30, will not make up the loss.

Pasture-grass, while young, maintains many animals; and the field is greatly recruited by what they drop; it is even recruited by hay crops, provided the grass be cut before feeding. But as old grass yields little profit, the field ought to be taken up for corn when the pasture begins to fail; and after a few crops, it ought to be laid down again with grass-seeds. Seduced by a chimerical notion, that a field, by frequent corn-crops, is fatigued and requires rest like a labouring man or animal, careful farmers give long rest to their fields by pasture, never adverting that it affords little profit. It ought to be their study, to improve their soil, by making it free, and also retentive of moisture. If they accomplish these ends, they need not be afraid of exhausting the soil by cropping.

190 Examples of rotations.

Where a farmer has access to no manure but what is his own production, the case under consideration, there are various rotations of crops, all of them good though perhaps not equally so. We shall begin with two examples, one in clay, and one in free soil, each of the farms 90 acres. Six acres are to be inclosed for a kitchen-garden, in which there must be annually a crop of red clover, for summer-food to the working cattle. As there are annually 12 acres in hay, and 12 in pasture, a single plough with good cattle will be sufficient to command the remaining 60 acres.

Rotation in a clay soil.

Inclos.	1775.	1776.	1777.	1778.	1779.	1780.
1.	Fallow.	Wheat.	Pease.	Barley.	Hay.	Oats.
2.	Wheat.	Pease.	Barley.	Hay.	Oats.	Fallow.
3.	Pease.	Barley.	Hay.	Oats.	Fallow.	Wheat.
4.	Barley.	Hay.	Oats.	Fallow.	Wheat.	Pease.
5.	Hay.	Oats.	Fallow.	Wheat.	Pease.	Barley.
6.	Oats.	Fallow.	Wheat.	Pease.	Barley.	Hay.
7.	Pasture.	Pasture.	Pasture.	Pasture.	Pasture.	Pasture.

When the rotation is completed, the seventh inclosure having been six years in pasture, is ready to be taken up for a rotation of crops which begins with oats in the year 1781, and proceeds as in the sixth inclosure. In the same year 1781, the fifth inclosure is made pasture, for which it is prepared by sowing pasture grass seeds with the barley of the year 1780. And in this manner may the rotation be carried on without end. Here the labour is equally distributed; and there is no hurry nor confusion. But the chief property of this rotation is, that two culmiferous or white-corn crops are never found together; by a due mixture of crops, the soil is preserved in good heart without any adventitious manure. At the same time, the land is always producing plentiful crops: neither hay nor pasture get time to degenerate. The whole dung is laid upon the fallow.

Every farm that takes a grass-crop into the rotation must be inclosed, which is peculiarly necessary in a clay soil, as nothing is more hurtful to clay than poaching.

Rotation in a free soil.

Inclos.	1775.	1776.	1777.	1778.	1779.	1780.
1.	Turnip.	Barley.	Hay.	Oats.	Fallow.	Wheat.
2.	Barley.	Hay.	Oats.	Fallow.	Wheat.	Turnip.
3.	Hay.	Oats.	Fallow.	Wheat.	Turnip.	Barley.
4.	Oats.	Fallow.	Wheat.	Turnip.	Barley.	Hay.
5.	Fallow.	Wheat.	Turnip.	Barley.	Hay.	Oats.
6.	Wheat.	Turnip.	Barley.	Hay.	Oats.	Fallow.
7.	Pasture.	Pasture.	Pasture.	Pasture.	Pasture.	Pasture.

For the next rotation, the seventh inclosure is taken up for corn, beginning with an oat-crop, and proceeding in the order of the fourth inclosure; in place of which, the third inclosure is laid down for pasture by sowing pasture-grasses with the last crop in that inclosure, being barley. This rotation has all the advantages

Practice. ges of the former. Here the dung is employed on the turnip-crop.

We proceed to confider what rotation is proper for carfe clay. The farm we propofe confifts of 73 acres. Nine are to be inclofed for a kitchen garden, affording plenty of red clover to be cut green for the farm-cattle. The remaining 64 acres are divided into four inclofures, 16 acres each, to be cropped as in the following table.

Inclof.	1775.	1776.	1777.	1778.
1.	Beans.	Barley.	Hay.	Oats.
2.	Barley.	Hay.	Oats.	Beans.
3.	Hay.	Oats.	Beans.	Barley.
4.	Oats.	Beans.	Barley.	Hay.

Here the dung ought to be applied to the barley.

Many other rotations may be contrived, keeping to the rules above laid down. Fallow, for example, wheat, peafe and beans, barley, cabbage, oats, for clay. Here dung muft be given both to the wheat and cabbage. For free foil, drilled turnip, barley, red clover, wheat upon a fingle furrow, drilled potatoes, oats. Both the turnip and potatoes muft have dung. Another for free foil: turnip drilled and dunged, red clover, wheat on a fingle furrow with dung, peafe, barley, potatoes, oats. The following rotation has proved fuccefsful in a foil proper for wheat. 1. Oats with red clover, after fallow, without dung. 2. Hay. The clover-ftubble dunged, and wheat fown the end of October with a fingle furrow. 3. Wheat. 4. Peafe. 5. Barley. Fallow again. Oats are taken the firft crop, to fave the dung for the wheat. Oats always thrive on a fallow, though without dung, which is not the cafe of barley. But barley feldom fails after peafe. In ftrong clay foil, the following rotation anfwers. 1. Wheat after fallow and dung. 2. Beans fown under furrow as early as poffible. Above the beans, fow peafe end of March, half a boll per acre, and harrow them in. The two grains will ripen at the fame time. 3. Oats or barley on a winter furrow with grafs-feeds. 4. Hay for one year or two; the fecond growth paftured. Lay what dung can be fpared on the hay ftubble, and fow wheat with a fingle furrow. 5. Wheat. 6. Beans or peafe. 7. Oats. Fallow again.

Sect. VI. *Of Reaping Corn and Hay Crops, and Storing them up for ufe.*

191 Of ripenefs. Culmiferous plants are ripe when the ftem is totally white: they are not fully ripe if any green ftreaks remain. Some farmers are of opinion, that wheat ought to be cut before it is fully ripe. Their reafons are, firft, that ripe wheat is apt to fhake; and next, that the flour is not fo good. With refpect to the laft, it is contrary to nature, that any feed can be better in an unripe ftate than when brought to perfection: nor will it be found fo upon trial. With refpect to the firft, wheat, at the point of perfection, is not more apt to fhake than for fome days before: the hufk begins not to open till after the feed is fully ripe; and then the fuffering the crop to ftand becomes ticklifh: after the minute of ripening, it fhould be cut down in an inftant, if poffible.

This leads to the hands that are commonly engaged to cut down corn. In Scotland, the univerfal practice was, to provide a number of hands, in proportion to the extent of the crop, without regard to the time of ripening. By this method, the reapers were often idle for want of work; and what is much worfe, they had often more work than they could overtake, and ripe fields were laid open to fhaking winds. The Lothians have long enjoyed weekly markets for reapers, where a farmer can provide himfelf with the number he wants; and this practice is creeping into neighbouring fhires. Where there is no opportunity of fuch markets, neighbouring farmers ought to agree in borrowing and lending their reapers. Practice. 192 Of reapers.

One fhould imagine, that a caution againft cutting corn when wet is unneceffary; yet from the impatience of farmers to prevent fhaking, no caveat is more fo. Why do they not confider, that corn ftanding dries in half a day; when, in a clofe fheaf, the weather muft be favourable if it dry in a month? in moift weather it will never dry.

With refpect to the manner of cutting, we muft premife, that barley is of all the moft difficult grain to be dried for keeping. Having no hufk, rain has eafy accefs; and it has a tendency to malten when wet. Where the ground is properly fmoothed by rolling, it feems beft to cut it down with the fcythe. This manner being more expeditious than the fickle, removes it fooner from danger of wind; and gives a third more ftraw, which is a capital article for dung, where a farm is at a diftance from other manure. We except only corn that has lodged; for there the fickle is more convenient than the fcythe. As it ought to be dry when cut, bind it up directly: if allowed to lie any time in the fwath, it is apt to be difcoloured.—Barley fown with grafs-feeds, red clover efpecially, requires a different management. Where the grafs is cut along with it, the difficulty is great of getting it fo dry as to be ventured in a ftack. The beft way is, to cut the barley with a fickle above the clover, fo as that nothing but clean barley is bound up. Cut with a fcythe the ftubble and grafs: they make excellent winter-food. The fame method is applicable to oats; with this only difference, that when the field is expofed to the fouth-weft wind, it is lefs neceffary to bind immediately after mowing. As wheat commonly grows higher than any other grain, it is difficult to manage it with the fcythe; for which reafon the fickle is preferred in England. Peafe and beans grow fo irregularly, as to make the fickle neceffary. 193 Manner of cutting.

The beft way for drying peafe, is to keep feparate the handfuls that are cut: though in this way they wet eafily, they dry as foon. In the common way of heaping peafe together for compofing a fheaf, they wet as eafily, and dry not near fo foon. With refpect to beans, the top of the handful laft cut, ought to be laid on the bottom of the former; which gives ready accefs to the wind. By this method peafe and beans are ready for the ftack in half the ordinary time. 194 Drying of peafe.

A fheaf commonly is made as large as can be contained in two lengths of the corn made into a rope. To fave frequent tying, the binder preffes it down with his knee, and binds it fo hard as totally to exclude the air, If there be any moifture in the crop, which feldom fails, a procefs of fermentation and putrefaction commences in 195 Size of fheaves.

Practice. in the ſheaf; which is perfected in the ſtack, to the deſtruction both of corn and ſtraw. How ſtupid is it, to make the ſize of a ſheaf depend on the height of the plants! By that rule, a wheat-ſheaf is commonly ſo weighty, as to be unmanageable by ordinary arms: it requires an effort to move it, that frequently burſts the knot, and occaſions loſs of grain, beſide the trouble of a ſecond tying. Sheaves ought never to be larger than can be contained in one length of the plant, cut cloſe to the ground; without admitting any exception, if the plants be above eighteen inches high. The binder's arm can then compreſs the ſheaf ſufficiently, without need of his knee. The additional hands that this way of binding may require, are not to be regarded, compared with the advantage of drying ſoon. Corn thus managed may be ready for the ſtack in a week; it ſeldom in the ordinary way requires leſs than a fortnight, and frequently longer. Of a ſmall ſheaf compreſſed by the arm only, the air pervades every part; nor is it ſo apt to be unlooſed as a large ſheaf, however firmly bound. We omit the gathering of ſheaves into ſhocks, becauſe the common method is good, which is to place the ſhocks directed to the ſouth-weſt, in order to reſiſt the force of the wind. Five ſheaves on each ſide make a ſufficient ſtay; and a greater number cannot be covered with two head-ſheaves.

196 Carrying off the victual.

Every article is of importance that haſtens the operation in a country, like Scotland, ſubjected to unequal harveſt-weather; for which reaſon, the moſt expeditious method ſhould be choſen for carrying corn from the field to the ſtack-yard. Our carriages are generally too ſmall or too large. A ſledge is a very aukward machine: many hands are required, and little progreſs made. Waggons and large carts are little leſs dilatory, as they muſt ſtand in the yard till unloaded ſheaf by ſheaf. The beſt way is, to uſe long carts moveable upon the axle, ſo as at once to throw the whole load on the ground; which is forked up to the ſtack by a hand appointed for that purpoſe. By this method, two carts will do the work of four or five.

197 Of ſtacking.

Building round ſtacks in the yard is undoubtedly preferable to houſing corn. There it is ſhut up from the air; and it muſt be exceedingly dry, if it contract not a muſtineſs, which is the firſt ſtep to putrefaction. Add to this, that in the yard, a ſtack is preſerved from rats and mice by being ſet on a pedeſtal; whereas no method has hitherto been invented for preſerving corn in a houſe from ſuch deſtructive vermin. The proper manner of building, is to make every ſheaf incline downward from its top to its bottom. Where the ſheaves are laid horizontally, the ſtack will take in rain both above and below. The beſt form of a ſtack is that of a cone placed on a cylinder; and the top of the cone ſhould be formed with three ſheaves drawn to a point. If the upper part of the cylinder be a little wider than the under, ſo much the better.

198 Covering the ſtacks.

The delaying to cover a ſtack for two or three weeks, though common, is, however, exceedingly abſurd; for if much rain fall in the interim, it is beyond the power of wind to dry the ſtack. Vegetation begun in the external parts, ſhuts out the air from the internal; and to prevent a total putrefaction, the ſtack muſt be thrown down, and expoſed to the air, every ſheaf. In order to have a ſtack covered the moment it is finiſhed, ſtraw and ropes ought to be ready; and the covering ought to be ſo thick as to be proof againſt rain. Practice.

Scotland is ſubject not only to floods of rain, but to high winds. Good covering guards againſt the former, and ropes artfully applied guards againſt the latter. The following is a good mode. Take a hay-rope well twiſted, and ſurround the ſtack with it, two feet or ſo below the top. Surround the ſtack with another ſuch rope immediately below the eaſing. Connect theſe two with ropes in an up-and-down poſition, diſtant from each other at the eaſing about five or ſix feet. Then ſurround the ſtack with other circular ropes parallel to the two firſt mentioned, giving them a twiſt round every one of thoſe that lie up and down, by which the whole will be connected together in a ſort of net-work. What remains is, to finiſh the two feet at the top of the ſtack. Let it be covered with bunches of ſtraw laid regularly up and down; the under part to be put under the circular rope firſt mentioned, which will keep it faſt, and the upper part be bound by a ſmall rope artfully twiſted, commonly called *the crown of the ſtack*. This method is preferable to the common way of laying long ropes over the top of the ſtack, and tying them to the belting-rope; which flattens the top, and makes it take in rain. A ſtack covered in the way here deſcribed, will ſtand two years ſecure both againſt wind and rain; a notable advantage in this variable climate. 199

Hay-making.

The great aim in making hay is, to preſerve as much of the ſap as poſſible. All agree in this; and yet differ widely in the means of making that aim effectual. To deſcribe all the different means would be equally tedious and unprofitable. We ſhall confine ourſelves to two, which appear preferable to all others. A crop of rye-graſs and yellow clover ought to be ſpread as cut. A day or two after, when the dew is evaporated, rake it into a number of parallel rows along the field, termed *wind-rows*, for the convenience of putting it up into ſmall cocks. After turning the rows once and again, make ſmall cocks weighing a ſtone or two. At the diſtance of two days or ſo, put two cocks into one, obſerving always to mix the tops and bottoms together, and to take a new place for each cock, that the leaſt damage poſſible may be done to the graſs. Proceed in putting two cocks into one, till ſufficiently dry for tramp-ricks of 100 ſtone each. The eaſieſt way of erecting tramp-ricks, is to found a rick in the middle of the row of cocks that are to compoſe it. The cocks may be carried to the rick by two perſons joining arms together. When all the cocks are thus carried to the rick within the diſtance of 40 yards or ſo, the reſt of the cocks will be more expeditiouſly carried to the rick, by a rope wound about them and dragged by a horſe. Two ropes are ſufficient to ſecure the ricks from wind the ſhort time they are to ſtand in the field. In the year 1775, 10,000 ſtone were put into tramp-ricks the fourth day after cutting. In a country ſo wet as many parts of Scotland are, expedition is of mighty conſequence in the drying both of hay and corn. With reſpect to hay intended for horned cattle, it is by the generality held an improvement, that it be heated a little in the ſtack. But we violently ſuſpect this doctrine to have been invented for excuſing indolent management. An ox, it is true, will eat ſuch hay; but it will always be found that he prefers ſweet hay; and it

Practice. it cannot well be doubted, but that fuch hay is the moft falutary and the moft nourifhing.

200 Hay of red clover. The making hay confifting chiefly of red clover, requires more care. The feafon of cutting is the laft week of June, when it is in full bloom; earlier it may be cut, but never later. To cut it later would indeed produce a weightier crop; but a late firft cutting makes the fecond alfo late, perhaps too late for drying. At the fame time, the want of weight in an early firft cutting, is amply compenfated by the weight of the fecond.

When the feafon is too variable for making hay of the fecond growth, mix ftraw with that growth, which will be a fubftantial food for cattle during winter. This is commonly done by laying ftrata of the ftraw and clover alternately in the ftack. But by this method, the ftrata of clover, if they do not heat, turn mouldy at leaft, and unpalatable. The better way is, to mix them carefully with the hand before they be put into the ftack. The dry ftraw imbibes moifture from the clover and prevents heating.

201 Other method. But the beft method of hay-making feems to be that recommended by Mr Anderfon*. "Inftead," fays he, "of allowing the hay to lie, as ufual in moft places, for fome days in the fwathe after it is cut, and afterwards alternately putting it up into cocks and fpreading it out, and tedding it in the fun, which tends greatly to bleach the hay, exhales its natural juices, and fubjects it very much to the danger of getting rain, and thus runs a great rifk of being good for little, I make it a general rule, if poffible, never to cut hay but when the grafs is quite dry; and then make the gatherers follow clofe upon the cutters,—putting it up immediately into fmall cocks about three feet high each when new put up, and of as fmall a diameter as they can be made to ftand with; always giving each of them a flight kind of thatching, by drawing a few handfuls of the hay from the bottom of the cock all around, and laying it lightly upon the top with one of the ends hanging downwards. This is done with the utmoft eafe and expedition; and when it is once in that ftate, I confider my hay as in a great meafure out of danger: for unlefs a violent wind fhould arife immediately after the cocks are put up, fo as to overturn them, nothing elfe can hurt the hay; as I have often experienced, that no rain, however violent, ever penetrates into thefe cocks but for a very little way. And, if they are dry put up, they never fit together fo clofely as to heat; although they acquire, in a day or two, fuch a degree of firmnefs, as to be in no danger of being overturned by wind after that time, unlefs it blows a hurricane.

* *Effays on Agriculture*, Vol. I. p. 186

"In thefe cocks I allow the hay to remain, until, upon infpection, I judge that it will keep in pretty large tramp-cocks (which is ufually in one or two weeks, according as the weather is more or lefs favourable, when two men, each with a long pronged pitchfork, lift up one of thefe fmall cocks between them with the greateft eafe, and carry them one after another to the place where the tramp-cock is to be built (A): and in this manner they proceed over the field till the whole is finifhed.

"The advantages that attend this method of making hay, are, That it greatly abridges the labour; as it does not require above the one-half of the work that is neceffary in the old method of turning and tedding it: That it allows the hay to continue almoft as green as when it is cut, and perferves its natural juices in the greateft perfection; for, unlefs it be the little that is expofed to the fun and air upon the furface of the cocks, which is no more bleached than every ftraw of hay faved in the ordinary way, the whole is dried in the moft flow and equal manner that could be defired: and, laftly, That it is thus in a great meafure fecured from almoft the poffibility of being damaged by rain. This laft circumftance deferves to be much more attended to by the farmer than it ufually is at prefent; as I have feen few who are fufficiently aware of the lofs that the quality of their hay fuftains by receiving a flight fhower after it is cut, and before it is gathered; the generality of farmers feeming to be very well fatisfied if they get in their hay without being abfolutely rotted; never paying the leaft attention to its having been feveral times wetted while the hay was making. But, if thefe gentlemen will take the trouble at any time to compare any parcel of hay that has been made perfectly dry, with another parcel from the fame field that has received a fhower while in the fwathe, or even a copious dew, they will foon be fenfible of a very manifeft difference between them; nor will their horfes or cattle ever commit a miftake in choofing between the two. 202 Advantages of this method.

"Let it be particularly remarked, that in this manner of making hay, great care muft be taken that it be dry when firft put into the cocks; for, if it is in the leaft degree wet at that time, it will turn inftantly mouldy, and fit together fo as to become totally impervious to the air, and will never afterwards become dry till it is fpread out to the fun. For this reafon, if at any time during a courfe of good fettled weather you fhould begin to cut in the morning before the dew is off the grafs, keep back the gatherers till the dew is evaporated; allowing that which was firft cut to lie till it is dry before it is cocked. In this cafe, you will almoft always find that the uncut grafs will dry fooner than that which has been cut when wet; and, therefore, the gatherers may always begin to put up that which is frefh cut before the other; which will ufually require two or three hours to dry after the new-cut hay may be cocked. And if, at any time, in cafe of neceffity, you fhould be obliged to cut your hay before it is dry, the fame rule muft be obferved, always to allow it to remain in the fwathe till it is quite dry: but, as there is always a great rifk of being long in getting it up, 203 Particular caution requifite in this method

(A) If the hay is to be carried to any confiderable diftance, this part of the labour may be greatly abridged, by caufing the carriers take two long fticks of a fufficient ftrength, and having laid them down by the fmall cocks parallel to one another, at the diftance of one and a half, or two feet afunder, let them lift three or four cocks, one after another, and place them carefully above the fticks, and then carry them altogether, as if upon a hand-barrow, to the place where the large rick is to be built.

Practice. up, and as it never in this case *wins* (A) so kindly as if it had been dry cut, the farmer ought to endeavour, if possible, in all cases, to cut his hay only when dry; even if it should cost him some additional expence to the cutters, by keeping them employed at any other work, or even allowing them to remain idle, if the weather should be variable or rainy.

"But if there is a great proportion of clover, and the weather should chance to be close and calm at the time, it may, on some occasions, be necessary to open up these cocks a little, to admit some fresh air into them; in which case, after they have stood a day or two, it may be of great use to turn these cocks and open them up a little, which ought to be done in the driest time of the day; the operator taking that part of each cock which was the top, and with it forming the base of a new one; so that the part which was most exposed to the air becomes excluded from it, and that which was undermost comes to be placed upon the top, so as to make it all dry as equally as possible.

"If the hay has not been damp when it was first put up, the cock may be immediately finished out at once; but if it is at all wet, it will be of great use to turn over only a little of the top of the cock at first, and leaving it in that state to dry a little, proceed to another, and a third, and fourth, &c. treating each in the same way; going on in that manner till you find that the inside of the first opened cock is sufficiently dried, when it will be proper to return to it, turning over a little more of it till you come to what is still damp, when you leave it and proceed to another, and so on round the whole; always returning afresh till the cocks are entirely finished. This is the best way of saving your hay, if you have been under the necessity of cutting it while damp; but it is always best to guard against this inconvenience, if possible."

204 Hay-stacks. In the yard, a stack of hay ought to be an oblong square, if the quantity be greater than to be easily stowed in a round stack; because a smaller surface is exposed to the air, than in a number of round stacks. For the same reason, a stack of pease ought to have the same form, the straw being more valuable than that of oats, wheat, or barley. The moment a stack is finished, it ought to be covered; because the surface-hay is much damaged by withering in dry weather, and moistening in wet weather. Let it have a pavilion-roof; for more of it can be covered with straw in that shape, than when built perpendicular at the ends. Let it be roped as directed above for corn-stacks; with this difference only, that in an oblong square the ropes must be thrown over the top, and tied to the belt-rope below. This belt-rope ought to be fixed with pins to the stack: the reason is, that the ropes thrown over the stack will bag by the sinking of the stack, and may be drawn tight by lowering the belt-rope, and fixing it in its new position with the same pins.

The stems of hops, being long and tough, make excellent ropes; and it will be a saving article, to propagate a few plants of that kind for that very end.

A stack of rye-grass hay, a year old, and of a moderate size, will weigh, each cubic yard, 11 Dutch stone. A stack of clover-hay in the same circumstances weighs somewhat less. Practice.

Sect. VII. *Manures.*

The manures commonly used are dung, lime, shell-marl, clay-marl, and stone-marl. Many other substances are used; shavings of horn, for example, refuse of malt, and even old rags: but as the quantity that can be procured is inconsiderable, and as their application is simple, we shall consume no time upon them.

Dung is the chief of all manures; because a quantity of it may be collected in every farm, and because it makes the quickest return. A field sufficiently dunged will produce good crops four or five years.

Dung of animals that chew the cud, being more thoroughly putrefied than that of others, is fit to be mixed with the soil without needing to be collected into a dunghill. A horse does not chew the cud; and in horse-dung may be perceived straw or rye-grass broken into small parts, but not dissolved: it is proper therefore that the putrefaction be completed in a dunghill. It ought to be mixed there with cool materials: so hot it is, that, in a dunghill by itself, it singes and burns instead of putrefying. The difference between the dung of a horse and of a horned animal, is visible in a pasture-field: the grass round the former is withered; round the latter, it is ranker and more verdant than in the rest of the field. A mixture of dry and moist stuff ought to be studied: the former attracting moisture from the latter, they become equally moist. 205 Dung.

To prevent sap from running out of a dunghill, its situation should be a little below the surface; and to prevent rain from running into it, it should be surrounded with a ring of sod. If the soil on which the dunghill stands be porous, let it be paved, to prevent the sap from sinking into the ground. If moisture happen to superabound, it may be led off by a small gutter to impregnate a quantity of rich mould laid down to receive it, which will make it equal to good dung. 206 Of a dunghill.

Straw should be prepared for the dunghill, by being laid under cattle, and sufficiently moistened. When laid dry into a dunghill, it keeps it open, admits too much air, and prevents putrefaction.

Dung from the stable ought to be carefully spread on the dunghill, and mixed with the former dung. When left in heaps upon the dunghill, fermentation and putrefaction go on unequally.

Complete putrefaction is of importance with regard to the seed of weeds that are in the dunghill: if they remain sound, they are carried out with the dung, and infest the ground. Complete putrefaction is of still greater importance by pulverizing the dung; in which condition it mixes intimately with the soil, and operates the most powerfully. In land intended for barley, undigested dung has a very bad effect: it keeps the ground open, admits drought, and prevents the seed from springing. On the other hand, when thoroughly rotted, it mixes with the soil, and enables it to retain moisture. It follows, that the properest time for dunging a field, is

(A) By *winning* hay, is meant the operation by which it is brought from the succulent state of grass to that of a dry fodder.

is in its higheſt pulverization ; at which time the earth mixes intimately with the dung. Immediately before

207 Time for dunging.

ſetting cabbage, ſowing turnip, or wheat, is a good time. Dung divides and ſpreads the moſt accurately when moiſt. Its intimate mixture with the ſoil is of ſuch importance, that hands ſhould be employed to divide and ſpread any lumps that may be in it.

208 Manner of dunging.

Dung ſhould be ſpread, and ploughed into the ground without delay. When a heap lies two or three weeks, ſome of the moiſture is imbibed into the ground, which will produce tufts of corn more vigorous than in the reſt of the field. There cannot be a worſe practice than to lead out dung before winter, leaving it expoſed to froſt and ſnow. The whole ſpirit of the dung is extracted by rain, and carried off with it. The dung diveſted of its ſap becomes dry in ſpring, and incapable of being mixed with the mould. It is turned over whole by the plough, and buried in the furrow.

209 Of collecting dung.

As dung is an article of the utmoſt importance in huſbandry, one ſhould imagine, that the collecting it would be a capital article with an induſtrious farmer. Yet an ingenious writer, obſerving that the Jamaicans are in this particular much more induſtrious than the Britiſh, aſcribes the difference to the difficulty of procuring dung in Jamaica. “ In England, where the long winter enables a farmer to raiſe what quantity he pleaſes, it is not collected with any degree of induſtry. But in Jamaica, where there is no winter, and where the heat of the ſun is a great obſtruction, the farmer muſt be indefatigable, or he will never raiſe any dung.” Cool intereſt is not alone a ſufficient motive with the indolent, to be active. As dung is of great importance in huſbandry, a farmer cannot be too aſſiduous in collecting animal and vegetable ſubſtances that will rot. One article of that kind there is, to collect which there is a double motive, and yet is neglected almoſt every where. A farm full of weeds is a nuiſance to the neighbourhood : it poiſons the fields around ; and the poſſeſſor ought to be diſgraced as a peſt to ſociety. Now the cutting down every weed before the ſeed is formed, anſwers two excellent purpoſes. Firſt, it encourages good crops, by keeping the ground clean. Next, theſe weeds mixed with other materials in a dunghill, may add conſiderably to the quantity of dung.

210 Of lime.

Next of lime, which is a profitable manure, and greatly ſo when it can be got in plenty within a moderate diſtance. The benefit of lime is ſo viſible, that the uſe of it has become general, where the price and carriage are in any degree moderate.

211 Its operation.

However people may differ in other particulars, all agree, that the operation of lime depends on its intimate mixture with the ſoil ; and therefore that the proper time of applying it, is when it is perfectly powdered and the ſoil at the ſame time in the higheſt degree of pulverization. Lime of itſelf is abſolutely barren ; and yet it enriches a barren ſoil. Neither of the two produces any good effect without the other : and conſequently, the more intimately they are mixed, the effect muſt be the greater.

Hence it follows, that lime ought always to be flaked with a proper quantity of water, becauſe by that means it is reduced the moſt effectually into powder. Lime left to be flaked by a moiſt air, or accidental rain, is ſeldom or never thoroughly reduced into powder ; and therefore can never be intimately mixed with the ſoil. Sometimes an opportunity offers to bring home ſhell-lime before the ground is ready for it ; and it is commonly thrown into a heap without cover, truſting to rain for flaking. The proper way is, to lay the ſhell-lime in different heaps on the ground where it is to be ſpread, to reduce theſe heaps into powder by flaking with water, and to cover the flaked lime with ſod ſo as to defend it from rain. One however would avoid as much as poſſible the bringing home lime before the ground be ready for it. Where allowed to lie long in a heap, there are two bad conſequences : firſt, lime attracts moiſture, even though well covered, and runs into clots, which prevents an intimate mixture ; and, next, we know, that burnt limeſtone, whether in ſhells or in powder, returns gradually into its original ſtate of limeſtone ; and upon that account alſo, is leſs capable of being mixed with the ſoil. And this is verified by a fact, that, after lying long, it is ſo hard bound together as to require a pick to ſeparate the parts.

For the ſame reaſon, it is a bad practice, though common, to let ſpread lime lie on the ſurface all winter. The bad effects above mentioned take place here in part : and there is another ; that rain waſhes the lime down to the furrows, and in a hanging field carries the whole away.

As the particles of powdered lime are both ſmall and heavy, they quickly ſink to the bottom of the furrow, if care be not taken to prevent it. In that view, it is a rule, that lime be ſpread, and mixed with the ſoil, immediately before ſowing, or along with the ſeed. In this manner of application, there being no occaſion to move it till the ground be ſtirred for a new crop, it has time to incorporate with the ſoil, and does not readily ſeparate from it. Thus, if turnip-ſeed is to be ſown broadcaſt, the lime ought to be laid on immediately before ſowing, and harrowed in with the ſeed. If a crop of drilled turnip or cabbage be intended, the lime ought to be ſpread immediately before forming in drills. With reſpect to wheat, the lime ought to be ſpread immediately before ſeed-furrowing. If ſpread more early, before the ground be ſufficiently broken, it ſinks to the bottom. If a light ſoil be prepared for barley, the lime ought to be ſpread after ſeed-furrowing, and harrowed in with the ſeed. In a ſtrong ſoil, it ſinks not ſo readily to the bottom ; and therefore, before ſowing the barley, the lime ought to be mixed with the ſoil by a brake. Where moor is ſummer-fallowed for a crop of oats next year, the lime ought to be laid on immediately before the laſt ploughing, and braked in as before. It has ſufficient time to incorporate with the ſoil before the land be ſtirred again. 212 Time of liming.

The quantity to be laid on depends on the nature of the ſoil. Upon a ſtrong ſoil, 70 or 80 bolls of ſhells are not more than ſufficient, reckoning four ſmall firlots to the boll, termed *wheat-meaſure* ; nor will it be an overdoſe to lay on 100 bolls. Between 50 and 60 may ſuffice upon medium ſoils ; and upon the thin or gravelly, between 30 and 40. It is not ſafe to lay a much greater quantity on ſuch ſoils. 213 Quantity.

It is common to lime a paſture-field immediately before ploughing. This is an unſafe practice ; it is thrown to the bottom of the furrow, from which it is never fully gathered up. The proper time for liming a 214 Liming paſture-fields.

Practice.

a pasture field, intended to be taken up for corn, is a year at least, or two, before ploughing. It is washed in by rain among the roots of plants, and has time to incorporate with the soil.

215 Beat limestone.

Limestone beat small makes an excellent manure; and supplies the want of powdered lime where there is no fuel to burn the limestone. Limestone beat small has not hitherto been much used as a manure; and the proportion between it and powdered lime has not been ascertained. What follows may give some light. Three pounds of raw lime is by burning reduced to two pounds of shell-lime. Yet nothing is expelled by the fire but the air that was in the limestone: the calcareous earth remains entire. *Ergo*, two pounds of shell-lime contain as much calcareous earth as three pounds of raw limestone. Shell-lime of the best quality, when slaked with water, will measure out to thrice the quantity. But as limestone loses none of its bulk by being burnt into shells, it follows, that three bushels of raw limestone contain as much calcareous earth as six bushels of powdered lime; and consequently, if powdered lime possess not some virtue above raw limestone, three bushels of the latter beat small should equal as a manure six bushels of the former.

216 Of shell-marl.

Shell-marl, as a manure, is managed in every respect like powdered lime; with this only difference, that a fifth or a fourth part more in measure ought to be given. The reason is, that shell-marl is less weighty than lime; and that a boll of it contains less calcareous earth, which is the fructifying part of both.

217 Of clay and stone-marls.

Clay and stone marls, with respect to husbandry, are the same, though in appearance different.

The goodness of marl depends on the quantity of calcareous earth in it: which has been known to amount to a half or more. It is too expensive if the quantity be less than a third or a fourth part. Good marl is the most substantial of all manures; because it improves the weakest ground to equal the best borough-acres. The low part of Berwickshire termed *the Merse*, abounds every where with this marl; and is the only county in Scotland where it is plenty.

Land ought to be cleared of weeds before marling; and it ought to be smoothed with the brake and harrow, in order that the marl may be equally spread. Marl is a fossil on which no vegetable will grow; its efficacy depends, like that of lime, on its pulverization, and intimate mixture with the soil. Toward the former, alternate drought and moisture contribute greatly, as also frost. Therefore, after being evenly spread, it ought to lie on the surface all winter. In the month of October it may be roused with a brake; which will bring to the surface, and expose to the air and frost, all the hard parts, and mix with the soil all that is powdered. In that respect it differs widely from dung and lime, which ought to be ploughed into the ground without delay. Oats is a hardy grain, which will answer for being the first crop after marling better than any other; and it will succeed though the marl be not thoroughly mixed with the soil. In that case, the marl ought to be ploughed in with an ebb furrow immediately before sowing, and braked thoroughly. It is ticklish to make wheat the first crop: if sown before winter, frost swells the marl, and is apt to throw the seed out of the ground; if sown in spring, it will suffer more than oats by want of due mixture.

Summer is the proper season for marling; because in that season the marl, being dry, is not only lighter, but is easily reduced to powder. Frost however is not improper for marling, especially as in frost there is little opportunity for any other work.

Marl is a heavy body, and sinks to the bottom of the furrow, if indiscreetly ploughed. Therefore the first crop should always have an ebb furrow. During the growing of that crop, the marl has time to incorporate with the soil, and to become a part of it; after which it does not readily separate.

SECT. VIII. *Principles and Operations of the New or Horse-hoeing Husbandry.*

THE general properties attributed to the new husbandry may be reduced to two, viz. the promoting the growth of plants by hoeing, and the saving of seed; both of which are equally profitable to the farmer.

The advantages of tillage before sowing have already been pointed out. In this place we must confine ourselves to the utility of tillage after sowing. This kind of tillage is most generally known by the name of *horse-hoeing*. 218 Advantages ascribed to horse-hoeing.

Land sowed with wheat, however well it may be cultivated in autumn, sinks in the winter; the particles get nearer together, and the weeds rise; so that in spring, the land is nearly in the same situation as if it never had been ploughed. This, however, is the season when it should branch and grow with most vigour; and consequently stands most in need of ploughing or hoeing, to destroy the weeds, to supply the roots with fresh earth, and, by dividing anew the particles of the soil, to allow the roots to extend and collect nourishment.

It is well known, that, in gardens, plants grow with double vigour after being hoed or transplanted. If plants growing in arable land could be managed with ease and safety in this manner, it is natural to expect, that their growth would be promoted accordingly. Experience shows, that this is not only practicable, but attended with many advantages.

In the operation of hoeing wheat, though some of the roots be moved or broken, the plants receive no injury; for this very circumstance makes them send forth a greater number of roots than formerly, which enlarge their pasture, and consequently augment their growth.

Sickly wheat has often recovered its vigour after a good hoeing, especially when performed in weather not very hot or dry.

Wheat, and such grain as is sown before winter, requires hoeing more than oats, barley, or other grain sown in the spring; for, if the land has been well ploughed before the sowing of spring-corn, it neither has time to harden, nor to produce many weeds, not having been exposed to the winter's snow and rain.

Of Sowing.

As, in the practice of the New Husbandry, plants grow with greater vigour than by the old method, the land should be sowed thinner. It is this principle of the new husbandry that has been chiefly objected to; for, upon observing the land occupied by a small number of plants, people are apt to look upon all the vacant 219 Method of sowing in the New Husbandry

Practice. cant ſpace as loſt. But this prejudice will ſoon be removed, when it is conſidered, that, in the beſt land cultivated in the common method, and ſown very thick, each ſeed produces but one or two ears; that, in the ſame land ſown thinner, every ſeed produces two or three ears; and that a ſingle ſeed ſometimes produces 18 or 21 ears.

In the common method, as there are many more plants than can find ſufficient nouriſhment, and as it is impoſſible to aſſiſt them by hoeing, numbers die before they attain maturity, the greateſt part remain ſickly and drooping; and thus part of the ſeed is loſt. On the contrary, in the new method, all the plants have as much food as they require; and as they are, from time to time, aſſiſted by hoeing, they become ſo vigorous as to equal in their production the numerous but ſickly plants cultivated in the common method.

Of Hoeing.

The new huſbandry is abſolutely impracticable in lands that are not eaſily ploughed. Attempting to cultivate land according to this huſbandry, without attending to this circumſtance, that it is practicable in no land excepting ſuch as have already been brought into good tilth by the old method, has gone far to make it contemptible in many places.

220 The different hoeings.

When a field is in good tilth, it ſhould be ſown ſo thin as to leave ſufficient room for the plants to extend their roots. After being well ploughed and harrowed, it muſt be divided into rows, at the diſtance of thirty inches from one another. On the ſides of each of theſe rows, two rows of wheat muſt be ſowed ſix inches diſtant from each other. By this means there will be an interval of two feet wide betwixt the rows, and every plant will have room enough to extend its roots, and to ſupply it with food. The intervals will likewiſe be ſufficient for allowing the earth to be hoed or tilled without injuring the plants in the rows.

The firſt hoeing, which ſhould be given before the winter, is intended to drain away the wet, and to diſpoſe the earth to be mellowed by the froſts. Theſe two ends will be anſwered by drawing two ſmall furrows at a little diſtance from the rows, and throwing the earth taken from the furrows into the middle of the intervals. This firſt hoeing ſhould be given when the wheat is in leaf.

The ſecond hoeing, which is intended to make the plants branch, ſhould be given after the hard froſts are over. To do this with advantage, after ſtirring the earth a little near the rows, the earth which was thrown in the middle of the intervals ſhould be turned back into the furrows. This earth, having been mellowed by the winter, ſupplies the plants with excellent food, and makes the roots extend.

The third hoeing, which is intended to invigorate the ſtalk, ſhould be given when the ears of the corn begin to ſhow themſelves. This hoeing may, however, be very ſlight.

But the laſt hoeing is of the greateſt importance, as it enlarges the grain, and makes the ears fill at their extremities. This hoeing ſhould be given when the wheat is in bloom; a furrow muſt be drawn in the middle of the interval, and the earth thrown to the right and left on the foot of the plants. This ſupports the plants, prevents them from being laid, and prepares the ground for the next ſowing, as the ſeed is then to be put in the middle of the ground that formed the intervals. Practice.

The beſt ſeaſon for hoeing is two or three days after rain, or ſo ſoon after rain as the ſoil will quit the inſtrument in hoeing. Light dry ſoils may be hoed almoſt any time, but this is far from being the caſe with ſtrong clay ſoils; the ſeaſon for hoeing ſuch is frequently ſhort and precarious; every opportunity therefore ſhould be carefully watched, and eagerly embraced. The two extremes of wet and dry, are great enemies to vegetation in ſtrong clay ſoils. There is a period between the time of clay ſoils running together, ſo as to puddle by ſuperfluous wet, and the time of their caking by drought, that they are as tractable as need be. This is the juncture for hoeing; and ſo much land as ſhall be thus ſeaſonably hoed, will not cake or cruſt upon the ſurface, as it otherwiſe would have done, till it has been ſoaked or drenched again with rain; in which caſe the hoeing is to be repeated as ſoon as the ſoil will quit the inſtrument, and as often as neceſſary; by which time the growing crop will begin to cover the ground, ſo as to act as a ſcreen to the ſurface of the land againſt the intenſe heat of the ſun, and thereby prevent, in great meaſure, the bad effects of the ſoil's caking in dry weather.

By this ſucceſſive tillage, or hoeing, good crops will be obtained, provided the weather is not very unfavourable.

But as ſtrong, vigorous plants are longer before they arrive at maturity, corn raiſed in the new way is later in ripening than any other, and muſt therefore be ſown earlier.

In order to prepare the intervals for ſowing again, ſome well-rooted dung may be laid in the deep furrows made in the middle of the intervals; and this dung muſt be covered with the earth that was before thrown towards the rows of wheat. But, if the land does not require mending, the deep furrow is filled without any dung. This operation ſhould be performed immediately after harveſt, that there may be time to give the land a ſlight ſtirring before the rows are ſowed; which ſhould occupy the middle of the ſpace which formed the intervals during the laſt crop. The intervals of the ſecond year take up the ſpace occupied by the ſtubble of the firſt.

Suppoſing dung to be neceſſary, which is denied by many, a very ſmall quantity is ſufficient; a ſingle layer, put in the bottom of each furrow, will be enough.

Description of the Instruments commonly uſed in the New Husbandry.

Fig. 1. is a marking plough. The principal uſe of this plough is to ſtraight and regulate the ridges. The firſt line is traced by the eye, by means of three poles, placed in a ſtraight line. The plough draws the firſt furrow in the direction of this line; and, at the ſame time, with the tooth A, fixed in the block of wood near the end of the croſs-pole or ſlider B B, marks the breadth of the ridge at the diſtance intended. The ploughman next traces the ſecond line or rutt made by the tooth, and draws a ſmall furrow along it; and continues in this manner till the whole field is laid out in ſtraight and equidiſtant ridges. 221 Inſtruments deſcribed. Plate VII.

Fig.

Practice.

Fig. 2. is a plough for breaking up lee, or turning up the bottom of land when greatly exhauſted. By its conſtruction, the width and depth of the furrows can be regulated to a greater certainty than by any other hitherto known in this country. Its appearance is heavy; but two horſes are ſufficient to plough with it in ordinary free land; and only four are neceſſary in the ſtiffeſt clay-ſoils. This plough is likewiſe eaſily held and tempered. A, is the ſword fixed in the ſizers B, which runs thro' a mortoiſe E, at the end of the beam C, and regulates the depth of the furrow by raiſing or depreſſing the beam; it is fixed by putting the pin D thro' the beam and ſword, and is moveable at E.

Plate VII.

Fig. 3. is a jointed brake-harrow with 24 teeth, ſhaped like coulters, and ſtanding at about an angle of 80 degrees. By this inſtrument the land is finely pulverized, and prepared for receiving the ſeed from the drill. It requires four horſes in ſtiff, and two in open, land. This harrow is likewiſe uſed for levelling the ridges; which is done by preſſing it down by the handles where the ridge is high, and raiſing it up when low.

Fig. 4. is an angular weeding harrow, which may follow the brake when neceſſary. The ſeven hindmoſt teeth ſhould ſtand at a more acute angle than the reſt, in order to collect the weeds, which the holder can drop at pleaſure, by raiſing the hinder part, which is fixed to the body of the harrow by two joints.

Fig. 5. is a pair of harrows with ſhafts. This harrow is uſed for covering the ſeed in the drills, the horſe going in the furrow.

Fig. 6. is a drill-plough, conſtructed in ſuch a manner as to ſow at once two rows of beans, peaſe, or wheat. This machine is eaſily wrought by two horſes. A, is the happer for containing the ſeed; B, circular boxes for receiving the ſeed from the happer; CC, two ſquare boxes which receive the ſeed from ſmall holes in the circular boxes, as they turn round; and laſt of all, the ſeed is dropped into the drills through holes in the ſquare boxes, behind the coulters D. The cylinder E follows, which, together with the wheel F, regulates the depth of the coulters, and covers the ſeed; the harrow G comes behind all, and covers the ſeed more completely. H H, two ſliders, which, when drawn out, prevent the ſeed from falling into the boxes; and, I, is a ketch which holds the rungs, and prevents the boxes from turning, and loſing ſeed at the ends of the ridges.

Fig. 7. is a ſingle hoe-plough of a very ſimple conſtruction, by which the earth in the intervals is ſtirred and laid up on both ſides to the roots of the plants, and at the ſame time the weeds are deſtroyed. A A the mould-boards, which may be raiſed or depreſſed at pleaſure, according as the farmer wants to throw the earth higher or lower upon the roots.

Plate VI.

Fig. 2. is a drill-rake for peaſe. This inſtrument, which is chiefly calculated for ſmall incloſures of light grounds, is a ſort of ſtrong plough rake, with four large teeth at *a*, *a*, *b*, *b*, a little incurvated. The diſtance from *a* to *a*, and from *b* to *b*, is nine inches. The interval between the two inner teeth, *a* and *b*, is three feet ſix inches, which allows ſufficient room for the hole-plough to move in. To the piece of timber *cc*, forming the head of the rake, are fixed the handles *d*, and the beam *e*, to which the horſe is faſtened. When this inſtrument is drawn over a piece of land made thoroughly fine, and the man who holds it bears upon the handles, four furrows, *f*, *g*, *h*, *i*, will be formed, at the diſtances determined by the conſtruction of the inſtrument. Theſe diſtances may be accurately preſerved, provided that the teeth *a a* return when the ploughman comes back, after having ploughed one turn, in two of the channels formed before, marked *b b*: thus all the furrows in the field will be traced with the ſame regularity. When the ground is thus formed into drills, the peaſe may be ſcattered by a ſingle motion of the hand at a certain diſtance from one another into the channels, and then covered with the flat part of a hand-rake, and preſſed down gently. This inſtrument is ſo ſimple, that any workman may eaſily make or repair it.

On 2d Plate VII. is delineated a patent drill machine, lately invented by the Reverend James Cooke of Heaton-Norris near Mancheſter. A, the upper part of the ſeed-box. B, the lower part of the ſame box. C, a moveable partition, with a lever, by which the grain or ſeed is let fall at pleaſure from the upper to the lower part of the ſeed-box, from whence it is taken up by cups or ladles applied to the cylinder D, and dropped into the funnel E, and conveyed thereby into the furrow or drill made in the land by the coulter F, and covered by the rake or harrow G. H, a lever, by which the wheel I is lifted out of generation with the wheel K, to prevent the grain or ſeed being ſcattered upon the ground, while the machine is turning round at the end of the land, by which the harrow G is alſo lifted from the ground at the ſame time, and by the ſame motion, by means of the crank, and the horizontal lever *h h*. L, a ſliding lever, with a weight upon it, by means of which, the depth of the furrows or drills, and conſequently the depth that the grain or ſeed will be depoſited in the land, may be eaſily aſcertained. M, a ſcrew in the coulter beam, by turning of which, the ſeed-box B is elevated or depreſſed, in order to prevent the grain or ſeed being cruſhed or bruiſed by the revolution of the cups or ladles. Fig. 13. a rake with iron teeth, to be applied to the under ſide of the rails of the machine, with ſtaples and ſcrew nuts at *n n*, by which many uſeful purpoſes are anſwered, viz. in accumulating cuitch or hay into rows, and as a ſcarificator for young crops of wheat in the ſpring, or to be uſed upon a fallow; in which caſe, the ſeed-box, the ladle cylinder, the coulters, the funnels, and harrows, are all taken away.

This ſide view of the machine is repreſented, for the ſake of perſpicuity, with one ſeed-box only, one coulter, one funnel, one harrow, &c. whereas a complete machine is furniſhed with five coulters, five harrows, ſeven funnels, a ſeed-box in eight partitions, &c. with ladles of different ſizes, for different ſorts of grain and ſeeds.

Theſe machines, (with five coulters ſixteen guineas, with four coulters fifteen guineas) equally excel in ſetting or planting all ſorts of grain and ſeeds, even carrot ſeed, to exactneſs, after the rate of from eight to ten chain acres per day, with one man, a boy, and two horſes. They depoſite the grain or ſeed in any given quantity from one peck to three buſhels per acre, regularly and uniformly, and that without grinding or bruiſing the ſeed, and at any given depth, from half an inch to half a dozen inches, in rows at the diſtance of

2 twelve,

twelve, fixteen, and twenty-four inches, or any other diftance. They are equally ufeful on all lands, are durable, eafy to manage, and by no means fubject to be put out of repair.

The ladle cylinder D is furnifhed with cups or ladles of four different fizes for different forts of grain or feeds, which may be diftinguifhed by the numbers 1, 2, 3, 4.—N° 1. (the fmalleft fize) is calculated for turnip-feed, clover-feed, cole-feed, rape, &c. and will fow fomething more than one pound per ftatute acre. N 2. for wheat, rye, hemp, flax, &c. and will fow fomething more than one bufhel per acre. N° 3. for barley; and will fow one bufhel and a half per acre. N° 4. for beans, oats, peafe, vetches, &c. and will fow two bufhels per acre.

Notwithftanding the above fpecified quantities of grain or feeds, a greater or lefs quantity of each may be fown at pleafure, by ftopping up with a little clay, or by adding a few ladles to each refpective box. The grain or feeds intended to be fown, muft be put in thofe boxes, to which the cups or ladles as above defcribed refpectively belong, an equal quantity into each box, and all the other boxes empty. The ladle cylinder may be reverfed, or turned end for end at pleafure, for different forts of grain, &c.

For fowing beans, oats, peafe, &c. with a five-coulter machine, four large ladles muft occafionally be applied at equal diftances round thofe parts of the cylinder which fubtend the two end boxes. And for fowing barley, eight large ones muft be applied as above; or four ladles, N° 2. to each of the wheat boxes. Thefe additional ladles are fixed on the cylinder with nails, or taken off in a few minutes; but for fowing with a four-coulter machine, the above alterations are not neceffary.

The funnels are applied to their refpective places by correfponding numbers. Care fhould be taken, that the points of the funnel ftand directly behind the backs of the coulters, which is done by wedges being applied to one fide or other of the coulters, at the time they are fixed in their refpective places.

The machine being thus put together, which is readily and expeditioufly done, as no feparate part will coincide with any other but that to which it refpectively belongs, and an equal quantity of grain or feed in each of the refpective boxes, the land alfo being previoufly ploughed and harrowed once or fo in a place to level the furface; but if the land be very rough, a roller will beft anfwer that purpofe, whenever the land is dry enough to admit of it; and upon ftrong clays, a fpiked roller is fometimes neceffary to reduce the fize of the large dry clods; which being done, the driver fhould walk down the furrow or edge of the land, and having hold of the laft horfe's head with his hand, he will readily keep him in fuch a direction, as will bring the outfide coulter of the machine within three or four inches of the edges of the land or ridge, at which uniform extent, he fhould keep his arm till he comes to the end of the land; where having turned round, he muft come to the other fide of his horfes, and walking upon the laft outfide drill, having hold of the horfe's head with his hand as before, he will readily keep the machine in fuch a direction, as will ftrike the fucceeding drill at fuch a diftance from the laft outfide one, or that he walks upon, as the coulters are diftant from each other.

The perfon who attends the machine fhould put down the lever H foon enough at the end of the land, that the cups or ladles may have time to fill, before he begins to fow; and at the end of the land, he muft apply his right hand to the middle of the rail between the handles, by which he will keep the coulters in the ground, while he is lifting up the lever H with his left hand, to prevent the grain being fcattered upon the headland, while the machine is turning round; this he will do with great eafe, by continuing his right hand upon the rail between the handles, and applying his left arm under the left handle, in order to lift the coulters out of the ground while the machine is turning round.

If there be any difficulty in ufing the machine, it confifts in driving it ftraight. As to the perfon who attends the machine, he cannot poffibly commit any errors, except fuch as are wilful, particularly as he fees at one view the whole procefs of the bufinefs, viz. that the coulters make the drills of a proper depth; that the funnels continue open to convey the grain or feed into the drills; that the rakes or harrows cover the grain fufficiently; and when feed is wanting in the lower boxes B, which he cannot avoid feeing, he readily fupplies them from the upper boxes A, by applying his hand, as the machine goes along, to the lever C. The lower boxes B, fhould not be fuffered to become empty before they are fupplied with feed, but fhould be kept nearly full, or within an inch or fo of the edge of the box.

If chalk lines are made acrofs the backs of the coulters, at fuch a diftance from the ends as the feed fhould be depofited in the ground (viz. about two inches for wheat, and from two to three for fpring corn), the perfon that attends the machine will be better able to afcertain the depth the feed fhould be depofited in the drills, by obferving, as the machine goes along, whether the chalk lines are above or below the furface of the land; if above, a proper weight muft be applied to the lever L, which will force the coulters into the ground; if below, the lever L and weight muft be reverfed, which will prevent their finking too deep.

In different parts of the kingdom, lands or ridges are of different fizes; where the machine is too wide for the land, one or more funnels may occafionally be ftopped with a little loofe paper, and the feed received into fuch funnel returned at the end of the land, or fooner if required, into the upper feed-box. But for regularity and expedition, lands confifting of fo many feet wide from outfide to outfide, as the machine contains coulters, when fixed at twelve inches diftance, or twice or three times the number, &c. are beft calculated for the machine. In wet foils or ftrong clays, lands or ridges of the width of the machine, and in dry foils, of twice the width, are recommended. For fowing of narrow high-ridged lands, the outfide coulters fhould be let down, and the middle ones raifed, fo that the points of the coulters may form the fame curve that the land or ridge forms. And the loofe foil harrowed down into the furrows fhould be returned to the edges of the lands or ridges from whence it came, by a double mould-board or other plough, whether the land be wet or dry.

Clover or other lays, intended to be fown by the machine,

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machine, should be ploughed a deep strong furrow and well harrowed, in order to level the surface, and to get as much loose soil as possible for the coulters to work in; and when sown, if any of the seed appears in the drills uncovered by reason of the stiff texture of the soil, or toughness of the roots, a light harrow may be taken over the land, once in a place, which will effectually cover the seed, without displacing it at all in the drills. For sowing lays, a considerable weight must be applied to the lever L, to force the coulters into the ground; and a set of wrought-iron coulters, well-steeled, and made sharp at the front edge and bottom, are recommended; they will pervade the soil more readily, consequently require less draught, and expedite business more than adequate to the additional expence.

For every half acre of land intended to be sown by the machine with the seed of that very valuable root, (carrot) one bushel of saw-dust, and one pound of carrot seed, should be provided; the saw-dust should be made dry, and sifted to take out all the lumps and chips, and divided into eight equal parts or heaps; the carrot-seed should likewise be dried, and well rubbed between the hands, to take off the beards, so that it will separate readily, and being divided into eight equal parts or heaps, one part of the carrot-seed must be well mixed with one part of the saw-dust, and so on, till all the parts of carrot-seed and saw-dust are well mixed and incorporated together; in which state it may be sown very regularly in drills at twelve inches distance, by the cups or ladles N° 2. Carrot-seed resembling saw-dust very much in its size, roughness, weight, adhesion, &c. will remain mixed as above during the sowing; a ladle-full of saw-dust will, upon an average, contain three or four carrot-seeds, by which means the carrot-seed cannot be otherwise than regular in the drills. In attempting to deposite small seeds near the surface, it may so happen that some of the seeds may not be covered with soil; in which case, a light roller may be drawn over the land after the seed is sown, which will not only cover the seeds, but will also, by levelling the surface, prepare the land for an earlier hoeing than could otherwise have taken place.

It has always been found troublesome, sometimes impracticable, to sow any kind of grain or seeds (even broad-cast) in a high wind. This inconvenience is entirely obviated, by placing a screen of any kind of cloth, or a sack, supported by two uprights nailed to the sides of the machine, behind the funnels, which will prevent the grain or seed being blown out of its direction in falling from the ladles into the funnels. Small pipes of tin may also be put on to the ends of the funnels, to convey the grain or seed so near the surface of the land, that the highest wind shall not be able to interrupt its descent into the drills.

Respecting the use of the machine, it is frequently remarked by some people not conversant with the properties of matter and motion, that the soil will close after the coulters, before the seed is admitted into the drills. Whereas the very contrary is the case; for the velocity of the coulters in passing through the soil, is so much greater than the velocity with which the soil closes up the drills by its own spontaneous gravity, that the incisions or drills will be constantly open for three or four inches behind the coulters; by which means, it is morally impossible (if the points of the funnels stand directly behind the coulters) that the seed with the velocity it acquires in falling through the funnels, shall not be admitted into the drills.

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Fig. 12. is a new constructed simple hand-hoe, by which one man will effectually hoe two chain acres per day, earthing up the soil at the same time to the rows of corn or pulse, so as to cause roots to issue from the first joint of the stem, above the surface of the land, which otherwise would never have existed. 2d Plate VII

This hoe is worked much in the same manner as a common Dutch hoe, or scuffle, is worked in gardens. The handle is elevated or depressed, to suit the size of the person that works it, by means of an iron wedge being respectively applied to the upper or under side of the handle that goes into the socket of the hoe.

The wings or moulding plates of the hoe, which are calculated to earth up the soil to the rows of corn, so as to cause roots to issue from the first joint of the stem above the surface, which otherwise would not have existed, should never be used for the first hoeing, but should always be used for the last hoeing, and used or not used, at the option of the farmer, when any intermediate hoeing is performed.

Summary of the Operations necessary in executing the New Husbandry with the Plough.

1. It is indispensably necessary that the farmer be provided with a drill and hoe-plough. 222 Summary of the operations.

2. The new husbandry may be begun either with the winter or spring corn.

3. The land must be prepared by four good ploughings, given at different times, from the beginning of April to the middle of September.

4. These ploughings must be done in dry weather, to prevent the earth from kneading.

5. The land must be harrowed in the same manner as if it were sowed in the common way.

6. The rows of wheat should be sowed very straight.

7. When the field is not very large, a line must be strained across it, by which a rill may be traced with a hoe for the horse that draws the drill to go in; and when the rows are sown, 50 inches must be left betwixt each rill. But, when the field is large, stakes at five feet distance from each other must be placed at the two ends. The workman must then trace a small furrow with a plough that has no mold-board, for the horse to go in that draws the drill, directing himself with his eye by the stakes.

8. The sowing should be finished at the end of September, or beginning of October.

9. The furrows must be traced the long way of the land, that as little ground as possible may be lost in headlands.

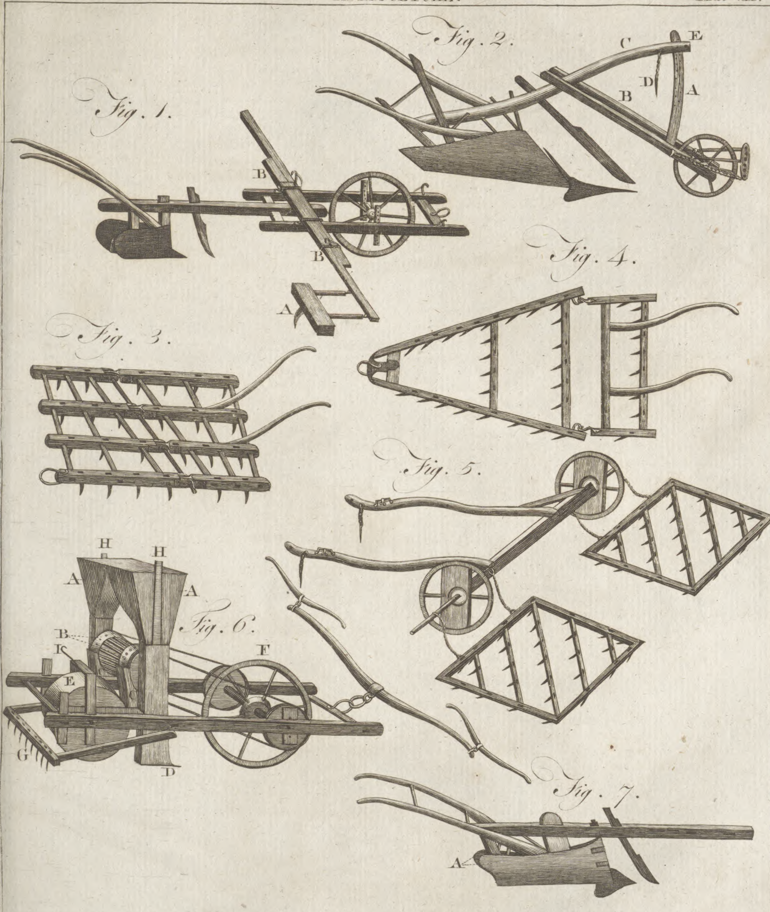
10. The rows, if it can be done, should run down the slope of the land, that the water may get the easier off.

11. The seed-wheat must be plunged into a tub of lime-water, and stirred, that the light corn may come to the surface and be skimmed off.

12. The seed must be next spread on a floor, and frequently stirred, till it is dry enough to run through the valves of the happer of the drill.

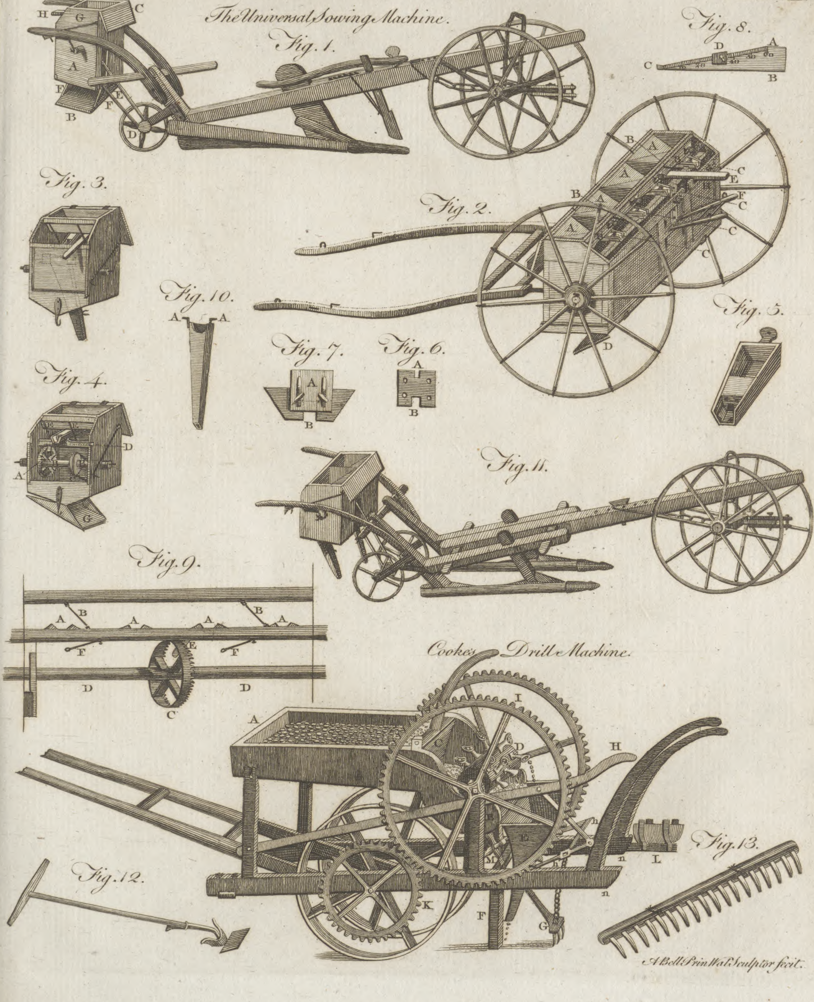
13. To prevent smut, the seed may be put into a ley of ashes and lime.

14. Good



A. Bell Sculp.t

AGRICULTURE. 2d Plate VII.



A. Bell Prin. Wal. Sculptor fecit.

Practice.

14. Good old seed-wheat should be chosen in preference to new, as it is found by experience not to be so subject to smut.

15. After the happers of the drill are filled, the horse must go slowly along the furrow that was traced. That a proper quantity of seed may be sown, the aperture of the happer must be suited to the size of the grain.

16. As the drill is seldom well managed at first, the field should be examined after the corn has come up, and the deficiencies be supplied.

17. Upon wet soils or strong clays, wheat should not be deposited more than two inches deep, on any account whatever; nor less than two inches deep on dry soils. From two to three inches is a medium depth for all spring corn. But the exact depth at which grain should be deposited in different soils, from the lightest sand to the strongest clay, is readily ascertained only by observing at what distance under the surface of the land, the secondary or coronal roots are formed in the spring.

18. Stiff lands, that retain the wet, must be stirred or hoed in October. This should be done by opening a furrow in the middle of the intervals, and afterwards filling it up by a furrow drawn on each side, which will raise the earth in the middle of the intervals, and leave two small furrows next the rows, for draining off the water, which is very hurtful to wheat in winter.

19. The next stirring must be given about the end of March, with a light plough. In this stirring the furrows made to drain the rows must be filled up by earth from the middle of the intervals.

20. Some time in May, the rows must be evened; which, though troublesome at first, soon becomes easy, as the weeds are soon kept under by tillage.

21. In June, just before the wheat is in bloom, another stirring must be given with the plough. A deep furrow must be made in the middle of the intervals, and the earth thrown upon the sides of the rows.

22. When the wheat is ripe, particular care must be taken, in reaping it, to trample as little as possible on the ploughed land.

23. Soon after the wheat is carried off the field, the intervals must be turned up with the plough, to prepare them for the seed. The great furrow in the middle must not only be filled, but the earth raised as much as possible in the middle of the intervals.

24. In September, the land must be again sowed with a drill, as above directed.

25. In October, the stubble must be turned in for forming the new intervals; and the same management must be observed as directed in the first year.

We pretend not to determine whether the old or new husbandry be preferable in every country. With regard to this point, the climate, the situation of particular land, skill and dexterity in managing the machinery, the comparative expence in raising crops, and many other circumstances, must be accurately attended to before a determination can be given.

The following comparative view of the old and new methods of culture, was furnished for the editors of Mr Tull's Horse-hoeing Husbandry, by a gentleman who for some years practised both in a country where the soil was light and chalky, like that from which he drew his observations. It is necessary to remark, that in the new husbandry every article is stated at its full value, and the crop of each year is four bushels short of the other; though, in several years experience, it has equalled and generally exceeded those of the neighbourhood in the old way.

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223 Comparative view of the expence and profits of the Old and New Husbandry.

"An estimate of the expence and profit of 10 acres of land in 20 years.

I. In the old way.

	L.	s.	d.	L.	s.	d.
First year, for wheat, costs 33 l. 5s. viz.						
First ploughing, at 6s. per acre	3	0	0			
Second and third ditto, at 8s. per acre -	4	0	0			
Manure, 30s. per acre -	15	0	0			
				22	0	0
Two harrowings, and sowing, at 2s. 6d. per acre -	1	5	0			
Seed, three bushels per acre, at 4s. per bushel -	6	0	0			
Weeding, at 2s. per acre -	1	0	0			
Reaping, binding, and carrying, at 6s. per acre -	3	0	0			
				11	5	0
Second year, for barley, costs 11l. 6s. 8d. viz.						
Once ploughing, at 6s. per acre - -	3	0	0			
Harrowing and sowing, at 1s. 6d. per acre -	0	15	0			
Weeding, at 1s. per acre -	0	10	0			
Seed, four bushels per acre, at 2s. per bushel -	4	0	0			
Cutting, raking, and carrying, at 3s. 2d. per acre -	1	11	8			
Grass-seeds, at 3s. per acre	1	10	0			
				11	6	8
				44	11	8
Third and fourth years, lying in grass, cost nothing: so that the expence of ten acres in four years comes to 44l. 11s. 8d. and in twenty years to -				222	18	4
First years produce is half a load of wheat per acre, at 7l.	35	0	0			
Second years produce is two quarters of barley per acre, at 1l. -	20	0	0			
Third and fourth years grass is valued at 1l. 10s. per acre	15	0	0			
So that the produce of ten acres in four years is	70	0	0			
And in twenty years it will be				350	0	0
Deduct the expence, and there remains clear profit on ten acres in twenty years by the old way - -				127	1	8

II. In the new way.

	L.	s.	d.
First year's extraordinary expence is, for ploughing and manuring the land, the same as in the old way	L. 22	0	0

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	L.	s.	d.	L.	s.	d.
Ploughing once more, at 4s. per acre -	2	0	0			
Seed, nine gallons per acre, at 4s. per buſhel -	2	5	0			
Drilling, at 7d. per acre -	0	5	10			
Hand-hoeing and weeding, at 2s. 6d. per acre -	1	5	0			
Horſe-hoeing ſix times, at 10s. per acre -	5	0	0			
Reaping, binding, and carrying, at 6s. per acre -	3	0	0			
The ſtanding annual charge on ten acres is -	13	15	10			
Therefore the expence on ten acres in twenty years is - - -				275	16	8
Add the extraordinaries of the firſt year, and the ſum is - -				297	16	8
The yearly produce is at leaſt two quarters of wheat per acre, at 1l. 8s. per quarter; which, on ten acres in twenty years, amounts to -				560	0	0
Therefore, all things paid, there remains clear profit on ten acres in twenty years by the new way - -				262	3	4

224 Arguments in favour of the New Method.

"So that the profit on ten acres of land in twenty years, in the new way, exceeds that in the old by L. 135 : 1 : 8, and conſequently is conſiderably more than double thereof; an ample encouragement to practiſe a ſcheme, whereby ſo great advantage will ariſe from ſo ſmall a quantity of land, in the compaſs of a twenty-one years leaſe; one year being allowed, both in the old and new way, for preparing the ground.

"It ought withal to be obſerved, that Mr Tull's huſbandry requires no manure at all, though we have here, to prevent objections, allowed the charge thereof for the firſt year; and moreover, that though the crop of wheat from the drill-plough is here put only at two quarters on an acre, yet Mr Tull himſelf, by actual experiment and meaſure, found the produce of his drilled wheat-crop amounted to almoſt four quarters on an acre."

It appears alſo from a comparative calculation of expence and profit between the drill and common huſbandry, taken from Mr Baker's report to the Dublin Society of his experiments in agriculture for the year 1765, that there is a clear profit ariſing upon an Iriſh acre of land in 15 years in the drill huſbandry of L. 52 : 3 : 11, and in the common huſbandry of L. 27 : 19 : 2; and therefore a greater profit in the drilled acre in this time of L. 24 : 4 : 9, which amounts to L. 1 : 12 : 3¼ per annum. From hence he infers, that in every 15 years the fee-ſimple of all the tillage-lands of the kingdom is loſt to the community by the common courſe of tillage. In ſtating the accounts, from which their reſult is obtained, no notice is taken of fences, water-cutting the land, weeding and reaping, becauſe theſe articles depend on a variety of circumſtances, and will, in general, exceed in the common huſbandry thoſe incurred by the other.

Beſides, the certainty of a crop is greater in this new way than in the old way of ſowing; for moſt of the accidents attending wheat crops, are owing to their being late ſown, which is neceſſary to the farmer in the old way; but in the horſe-hoeing method the farmer may plough two furrows whereon the next crop is to ſtand immediately after the firſt crop is off. In this manner of huſbandry, the land may be ploughed dry and drilled wet, without any inconvenience; and the ſeed is never planted under the furrow, but placed juſt at the depth which is moſt proper, that is, at about two inches; in which caſe it is eaſy to preſerve it, and there is no danger of burying it. Thus the ſeed has all the advantage of early ſowing, and none of the diſadvantages that may attend it in the other way, and the crop is much more certain than by any other means that can be uſed.

The condition in which the land is left after the crop, is no leſs in favour of the horſe-hoeing huſbandry than all the other articles. The number of plants is the great principle of the exhauſting of land. In the common huſbandry, the number is vaſtly greater than in the drilling way, and three plants in four often come to nothing, after having exhauſted the ground as much as profitable plants; and the weeds which live to the time of harveſt in the common way, exhauſt the land no leſs than ſo many plants of corn, often much more. The horſe-hoeing method deſtroys all the weeds in the far greater part of the land, and leaves that part unexhauſted and perfectly freſh for another crop. The wheat plants being alſo but a third part of the number at the utmoſt of thoſe in the ſowing way, the land is ſo much the leſs exhauſted by them; and it is very evident from the whole, that it muſt be, as experience proves that it is, left in a much better condition after this than after the common huſbandry.

225 Objections and anſwers.

The farmers who are againſt this method object, that it makes the plants too ſtrong, and that they are more liable to the blacks or blights of inſects for that reaſon; but as this allows that the hoeing can, without the uſe of dung, give too much nouriſhment, it is very plain that it can give enough; and it is the farmer's fault if he do not proportion his pains ſo as to have the advantage of the nouriſhment without the diſadvantages. It is alſo objected, that as hoeing can make poor land rich enough to bear good crops of wheat, it may make good land too rich for it. But if this ſhould happen, the ſowing of wheat on it may be let alone a while, and in the place of it the farmer may have a crop of turnips, carrots, cabbages, and the like, which are excellent food for cattle, and cannot be over-nouriſhed: or, if this is not choſen, the land, when thus made too rich, may ſoon be ſufficiently impoveriſhed by ſowing corn upon it in the common old way.

The method of horſe-hoeing huſbandry, ſo ſtrongly recommended by Mr Tull, is objected to by many on account of the largeneſs of the intervals which are to be left behind the rows of corn. Theſe are required to be about five feet wide; and it is thought that ſuch wide ſpaces are ſo much loſt earth, and that the crop is to be ſo much the leſs for it. But it is to be obſerved, that the rows of corn ſeparated by theſe intervals need not be ſingle; they may be double, triple, or quadruple, at the pleaſure of the farmer; and four rows thus ſtanding as one will have the five foot interval but one-fourth of its bigneſs as to the whole quantity, and it will be but as fifteen inch intervals to plants in

Practice.

in ſingle rows. Corn that is ſown irregularly in the common way, ſeems indeed to cover the ground better than that in rows: but this is a mere *deceptio viſus*; for the ſtalks of corn are never ſo thick as when they come out of one plant, or as when they ſtand in a row; and a horſe-hoed plant of corn will have 20 or 30 ſtalks in a piece of ground of the ſame quantity, where an unhoed plant will have only two or three ſtalks. If theſe ſtalks of the hoed plant were ſeparated and planted over the intervals, the whole land would be better covered than it is in the common way; and the truth is, that though theſe hoed fields ſeem to contain a much leſs crop than the common ſown fields, yet they in reality do contain a much greater. It is only the different placing that makes the ſown crop ſeem the larger, and even this is only while both crops are young.

The intervals are not loſt ground, as is uſually ſuppoſed, but when well horſe-hoed they are all employed in the nouriſhment of the crop; the roots of the plants in the adjoining rows ſpreading themſelves thro' the whole interval, and drawing ſuch nouriſhment from it, that they increaſe accordingly. When the plants ſtand in the ſcattered way, as in common ſowing, they are too cloſe to one another; each robs its neighbours of part of their nouriſhment, and conſequently the earth is ſoon exhauſted, and all the plants half ſtarved. The cloſe ſtanding of them alſo prevents the benefit of after-tilling, as the hoe cannot be brought in, nor the ground by any means ſtirred between them to give it a new breaking, and conſequently afford them new food.

Experiments have abundantly proved, that in large grounds of wheat where the different methods have been tried, thoſe parts where the intervals were largeſt have produced the greateſt crops, and thoſe where hoeing was uſed without dung have been much richer than thoſe where dung was uſed without hoeing. If it were poſſible that plants could ſtand as thick, and thrive as well over the whole ſurface of the ground, as they do in the rows ſeparated by theſe large intervals, the crops of corn ſo produced would be vaſtly greater than any that have been heard of; but the truth is, that plants receive their growth not according to the ground they ſtand on, but to the ground they can extend their roots into; and therefore a ſingle row may contain more plants than a large interval can nouriſh, and therefore the ſame number that ſtand in that row, and no more than theſe, could be nouriſhed, if ſcattered over the whole interval; and they would be much worſe nouriſhed in that way; becauſe while the interval is void, the earth may be ſtirred about them, and new roots will be formed in great numbers from every one broken by the inſtruments, and new nouriſhment laid before theſe roots by the breaking the particles of earth, by which the plants will have ſupplies that they cannot have when ſcattered over the whole ſurface, becauſe the ground is then all occupied, and cannot be moved between the plants.

226 In what circumſtance the new method is leſs proper.

All ſoils and all ſituations are not equally proper for this method of planting in rows, with large intervals and hoeing between. The lighteſt ſoils ſeem to be beſt for it, and the tough and wet clays the worſt. Such grounds as lie on the ſides of hills are alſo leſs proper than others for this work.

This method is not ſo proper in common fields, but that not in reſpect of the ſoil, but of the huſbandry of the owners, who are uſually in the old way, and change the ſpecies of corn, and make it neceſſary to fallow every ſecond, third or fourth year. Nevertheleſs it has been found by later experiments, that the intervals betwixt the rows of plants, as recommended by Mr Tull, were too great, perhaps double of what they ſhould be in the moſt profitable method of culture; by which means much leſs crops are obtained than might be produced at nearly the ſame expence. This has rendered the profits of the drill method much leſs than they would have been in a more judicious practice, and, conſequently, has proved a great diſadvantage to it in compariſon with the broad-caſt. Mr Tull was led into this, partly from the want of more perfect inſtruments for hoeing, and of ploughs proper for drilling.

To the preceding ſtatements, the following obſervations by Sir John Anſtruther, publiſhed among the Select Papers of the Bath Society, may not be improperly ſubjoined.

227 Obſervations by Sir John Anſtruther.

The ſlow progreſs which the Drill-huſbandry has made in many parts of Great Britain ſince Mr Tull's time, he obſerves, has been principally owing to the want of proper drill-ploughs. Before drilling can become general, thoſe ploughs muſt be ſimple, ſuch as a common ploughman accuſtomed to uſe ſtrong inſtruments can uſe without breaking, and ſuch alſo as common workmen can eaſily make or repair. Mathematical accuracy he conſiders as not required for delivering the ſeed: for it matters very little whether there be a quarter of a peck more or leſs ſown, if it be delivered with tolerable regularity. He therefore had a plough made, according to his own directions, by a common plough-wright, of ſufficient ſtrength for any land made fit for turnips or wheat. It was tried on very rough ground unfit for ſowing, in order to aſcertain its ſtrength; and it had been uſed for eight years without its needing any repair. It is a double drill-plough, which ſows two ridges at a time, the horſe going in the furrow between them, and of courſe does not tread upon the ground intended to be ſown; which with a ſingle drill muſt be the caſe, and does much harm by the horſes feet ſinking and making holes in the fine ground, which retain the water, and hurt the wheat when young.

He proceeds to obſerve, "That having read Mr Forbes upon the extenſive practice of the new huſbandry, and ſome other authors, who gave a more clear and diſtinct account of the different operations in drilling than had heretofore been given, I wiſhed to try them, and to adapt my plough to ſow the quantities therein directed. It was, however, adjuſted to ſow a ſmaller quantity, and the ſeed was not ſteeped.

"Not having ground ſo proper as I wiſhed, it was drilled on the ſide of a field, the ſoil of which was light and ſandy, and in ſuch bad order, that the preceding crop was a very indifferent one. It was therefore manured with a compoſt dung-hill.

"After croſs-ploughing and manuring, it was laid into four and a half feet ridges, then harrowed and drilled with one peck and a half of wheat on an acre and a quarter, which is nearly one peck and a fifth per Engliſh acre. It was drilled the 27th of October, and rolled after drilling. The crop was late in its appearance, and very backward in the ſpring.

"March 31st, it was horse-hoed one furrow *from* the rows.

"April 8th, it was hand-hoed and weeded in the rows.

"25th, horse-hoed again, laying a furrow back *to* the rows.

"May 15th, hand-hoed the second time.

"June 2d, horse-hoed *from* the rows.

"June 12th, hand-hoed the third time.

"July 14th, horse-hoed *to* the rows.

"At this last hoeing, as many of the ears were beaten down into the intervals by wind and rain, a man went before the horse-hoe, and turned the ears back into their proper place.

"The crop, when reaped and threshed, yielded me 36 bushels on one acre and a quarter, which is 28 bushels and three pecks per acre; and the produce from one peck and half 96 for one.

"As the produce appeared so great, from land in such bad order, it was carefully measured again, and found to be right. But this increase, though great, was not so large as Mr Crake of Glasgow had without dung.

"Mr Randal says, 'It is an experimented fact, that on a fine loam exquisitely prepared, 144 bushels have been produced from one acre. And, I believe, it is not known what the increase may be brought to in rich lands by high cultivation.'

"Some years since, I had beans dropt alternately with potatoes, at two feet distance in the rows, which were three feet apart, and ploughed in the intervals. The land adjoining was sown with beans and pease, which were a good crop; but those sown among the potatoes a better one. I pulled one stem of the beans planted with the potatoes, which had three branches rising from the bottom, and it produced 225 beans. In all the trials of drilled beans, most of the stems had two branches, with many pods upon each.——From these and other instances, I believe it is not yet known to what increase grain may be brought by drilling, good cultivation, and manure.

"Horse-hoeing is certainly preferable to close drilling or hand-hoeing; but the latter is superior to broadcast.

"Horse-hoeing the full depth increases the crop, by making it tiller or branch more than it otherwise would do; and the advantage is distinctly observable every hoeing, by the colour of the grain. It prepares the ground for the next crop, at the same time that it increases the crop growing, which hand-hoeing does not, although it may destroy the weeds. Thus drilled ground is kept in a loose open state to receive the benefit of the influence of the air and weather, which broadcoast has not; and it is evident, from certain experience, that crops may be drilled many years to good advantage without manure.

"Suppose the crops only 20 bushels per acre, what course of broadcast crops will give 5 l. an acre for the course? But suppose they are dunged the same as any ground in the most approved course, there is the greatest reason to expect as much as in the above experiment, which is 28 and three-quarters, and at 5s. per bushel amounts to 7l. 3s. 9d.

"Calculations may be of service to those who wish to try drilling, and have few books to direct them.

"One acre is 10 chains long, of 660 feet, or 220 yards long, and one yard broad, containing 4840 square yards. Then if the ridge is four feet six inches, this makes 14 ridges, and three feet to spare. This length of 220 yards, multiplied by 14 (the number of ridges) gives a length of yards 3080, to which add 146 for the spare three feet, and it will be 3226 yards. And as two rows are drilled on a ridge, the number of rows will be in length 6452 yards; but as a deduction of 172 yards must be made for the head ridges, suppose three yards each, &c. the whole length to be sown will be 6280 yards clear. Now a gallon (Winchester) holds about 80,000 grains. The quantity recommended to be drilled by Mr Forbes and others, being six gallons, or two-thirds of a bushel per acre, is nearly 78 grains to a yard, or 26 to a foot. But in my experiment, by this calculation, it was only about 11 grains to a foot; which is quite sufficient, if the seed be good, and it be not destroyed by vermin.

"Now with regard to the quantity of land this drill-plough may sow; if a horse walks at the rate of two miles per hour, he goes 16 miles in eight hours, or 28,460 yards. As he sows two ridges at once, this is seven lengths and two-thirds per acre, or 1686 yards to sow an acre, being nearly 17 acres in a day.

"Four horse-hoeings are calculated equal to two ploughings. In plain ploughing they suppose the ridge is ploughed with four furrows, or eight for twice ploughing. The four horse-hoeings are eight furrows, equal to two ploughings.

"Mr Tull directs four hoeings, and Mr Forbes five. First, In November, when the plant has four blades. 2dly, In March, deep, and nearer the rows than the former; both these hoeings should be *from* the rows. 3dly, Hand-hoed when it begins to spindle, if the earth be crumbly, *to* the rows. 4thly, When it begins to blossom, *from* the rows, but as near to them as in the second hoeing. 5thly, When done blossoming, to ripen and fill the grain, *to* the rows.

"The last hoeing Mr Tull does not direct, but Mr Forbes advises it, as being of essential service in filling the grain, and saving trouble in making the next seed-furrows. They advise the patent or sowing-plough for horse-hoeing; and the expence is calculated by Mr Craick at one guinea per acre, reaping included.

"But let us suppose the following, which are the prices in the county I live in (Fife).

	L.	s.	d.
Ploughing to form the ridges, -	0	4	0
Harrowing, - - -	0	0	4
Four hoeings, equal to two ploughings,	0	8	0
Sowing, - - -	0	0	4
Hand-hoeing twice, - -	0	8	0
Seed, one peck and a half, at 5s. a bushel,	0	1	10
Whole expence per acre, -	L. 1	2	6"

228 The drill and the broad-cast methods more particularly compared.

Drill-husbandry is, as a good writer has justly defined it, "*the practice of a garden brought into the field.*" Every man of the least reflection must be sensible, that the practice of the garden is much *better* than that of the field, only a little more expensive; but if (as is the case) this extra expence be generally much more than rapid by the superior goodness and value of drilled crops, it ought to have no weight in comparing the two modes of husbandry.

In

In the broadcast method the land is often sown in bad tilth, and always scattered at random, sometimes by very unskilful hands. In drilling, the land must be in fine order; the seed is set in trenches drawn regularly, all of nearly an equal depth, and that depth suited to the nature of each kind of seed. These seeds are also distributed at proper distances, and by being equally and speedily covered, are protected from vermin and other injuries; so that the practice of the garden is here exactly introduced into the field.

In the broadcast method the seed falls in some places too thick, in others too thin; and being imperfectly covered, a part of it is devoured by vermin which follow the sower; another part is left exposed to rain or frost, or to heats, which greatly injure it. When harrowed, a great part of it (small seeds especially) is buried so deep, that if the soil be wet, it perishes before it can vegetate.

Again: When thus sown, there is no meddling with the crop afterwards, because its growth is irregular. The soil cannot be broken to give it more nourishment, nor can even the weeds be destroyed without much inconvenience and injury.

But in the drill-husbandry the intervals between the rows, whether double or single, may be horse-hoed; and thereby nourishment may repeatedly be given to the plants, and the weeds almost totally destroyed.

The very same effects which digging has upon young shrubs and trees in a garden, will result from horse-hoeing in a field, whether the crop be corn or pulse: For the reason of the thing is the same in both cases, and being founded in nature and fact, cannot ever fail. In drilling, no more plants are raised on the soil than it can well support; and by dividing and breaking the ground they have the full advantage of all its fertility.

The plough prepares the land for a crop, but goes no further; for in the broadcast husbandry it cannot be used: but the crop receives greater benefit from the tillage of the land by the horse-hoe, while it is growing, than it could in the preparation. No care in tilling the land previous to sowing can prevent weeds rising with the crop; and if these weeds be not destroyed while the crop is growing, they will greatly injure it. In the broadcast husbandry this cannot be done; but in drilling, the horse-hoe will effect it easily.

And what adds to the farmer's misfortune is, that the most pernicious weeds have seeds winged with down, which are carried by the wind to great distances; such are thistles, sow-thistles, colts-foot, and some others.

If the expence of horse-hoeing be objected, there are two answers which may very properly be made: The first is, that this expence is much less than that of hand-hoeing were it practicable, or of hand-weeding. The second is, that it is more than rapid by the quantity of seed saved by drilling; to say nothing of the extra quantity and goodness of the crops, which are generally self-evident.

Upon the whole: If the particular modes of cultivating land by the new husbandry should, after all, be considered as perhaps too limited to be universally adopted; yet it has been of great use in raising suspicions concerning the old method, and in turning the views of philosophers and farmers towards improving in general. Many real improvements in agriculture have been the consequences of these suspicions; and as this spirit of inquiry remains in full vigour, a solid foundation is laid for expecting still further improvements in this useful art.

AGRIFOLIUM, or AQUIFOLIUM. See ILEX.

AGRIGENTUM, (anc. geog.), a city of Sicily, part of the site of which is now occupied by a town called *Girgenti* from the old name. See GIRGENTI.

According to ancient authors, Dedalus, the most famous mechanician of fabulous antiquity, fled to this spot for protection against Minos, and built many wonderful edifices for Cocalus king of the island. Long after his flight, the people of Gela sent a colony hither 600 years before the birth of Christ; and from the name of a neighbouring stream called the new city *Acragas*, whence the Romans formed their word *Agrigentum*. These Greeks converted the ancient abode of the Siculi into a citadel to guard the magnificent city, which they erected on the hillocks below.

An advantageous situation, a free government with all its happy effects, and an active commercial spirit, exalted their commonwealth to a degree of riches and power unknown to the other Greek settlements, Syracuse alone excepted. But the prosperity of Agrigentum appears to have been but of short duration, and tyranny soon destroyed its liberties.

Phalaris was the first that reduced it to slavery. His name is familiar to most readers on account of his cruelty, and the brazen bull in which he tortured his enemies: (See PHALARIS.)—Phalaris met with the common fate of tyrants, and after his death the Agrigentines enjoyed their liberty for 150 years; at the expiration of which term Thero usurped the sovereign authority. The moderation, justice, and valour of this prince preserved him from opposition while living, and have rescued his memory from the obloquy of posterity. He joined his son-in-law Gelo, king of Syracuse, in a war against the Carthaginians; in the course of which victory attended all his steps, and Sicily saw herself for a time delivered from her African oppressions. Soon after his decease, his son Thrasydeus was despoiled of the diadem, and Agrigentum restored to her old democratical government. Ducetius next disturbed the general tranquillity. He was a chief of the mountaineers, descendants of the Siculi; and was an overmatch for the Agrigentintes while they were unsupported by alliances, but sank under the weight of their union with the Syracusans. Some trifling altercations dissolved this union, and produced a war, in which the Agrigentines were worsted, and compelled to submit to humiliating terms of peace. Resentment led them to embrace with joy the proposals of the Athenians, then meditating an attack upon Syracuse. Their new friends soon made them feel that the sacrifice of liberty and fortune would be the price of their protection; and this consideration brought them

Agrigentum.

ſpeedily back to their old connections. But as if it had been decreed that all friendſhip ſhould be fatal to their repoſe, the reconciliation and its effects drew upon them the anger of the Carthaginians. By this enemy their armies were routed, their city taken, their race almoſt extirpated, and ſcarce a veſtige of magnificence was left. Agrigentum lay 50 years buried under its own ruins; when Timoleon, after triumphing over the Carthaginians, and reſtoring liberty to Sicily, collected the deſcendants of the Agrigentines, and ſent them to re-eſtabliſh the dwellings of their forefathers. Their exertions were rewarded with aſtoniſhing ſucceſs; for Agrigentum roſe from its aſhes with ſuch a renewal of vigour, that in a very ſhort time we find it engaged in the bold ſcheme of ſeizing a lucky moment, when Agathocles and Carthage had reduced Syracuſe to the loweſt ebb, and arrogating to itſelf ſupremacy over all the Sicilian republics. Xenodicus was appointed the leader of this arduous enterpriſe; and had his latter operations been as fortunate as his firſt campaign, Agrigentum would have acquired ſuch a preponderance of reputation and power, that the rival ſtates would not even have dared to attack it. But a few brilliant exploits were ſucceeded by a ſevere overthrow; the Agrigentines loſt courage, diſagreed in council, and humbly ſued for peace to Agathocles. This commonwealth afterwards took a ſtrong part with Pyrrhus; and when he left Sicily to the mercy of her enemies, threw itſelf into the arms of Carthage. During the firſt Punic war Agrigentum was the head-quarters of the Carthaginians, and was beſieged by the Roman conſuls, who after eight months blockade took it by ſtorm. It neverthelefs changed maſters ſeveral times during the conteſt between thoſe rival ſtates, and in every inſtance ſuffered moſt cruel outrages. After this period very little mention of it occurs in hiſtory, nor do we know the preciſe time of the deſtruction of the old city and the building of the new one. See Girgenti.

The principal part of the ancient city lay in the vale; the preſent town, called Girgenti, occupies the mountain on which the citadel of Cocalus ſtood.

It was difficult to be more judicious and fortunate in the choice of ſituation for a large city. The inhabitants were here provided with every requiſite for defence, pleaſure, and comfort of life; a natural wall, formed by abrupt rocks, preſented a ſtrong barrier againſt aſſailants; pleaſant hills ſheltered them on three ſides without impeding the circulation of air; before them a broad plain watered by the Acragas, gave admittance to the ſea-breeze, and to a noble proſpect of that awful element; the port or emporium lay in view at the mouth of the river, and probably the road acroſs the flat was lined with gay and populous ſuburbs.

The hoſpitality and parade for which the Agrigentines are celebrated in hiſtory were ſupported by an extenſive commerce; by means of which, the commonwealth was able to reſiſt many ſhocks of adverſity, and always to riſe again with freſh ſplendour. It was, however, cruſhed by the general fall of Grecian liberty; the feeble remnants of its population, which had ſurvived ſo many calamities, were at length driven out of its walls by the Saracens, and obliged to lock themſelves up for ſafety among the bleak and inacceſſible rocks of the preſent city.

At the north-eaſt angle of the ancient limits, upon ſome foundations of large regular ſtones, a church has been erected; a road appears hewn in the ſolid rock for the convenience of the votaries that viſited this temple in ancient days. It was then dedicated to Ceres and her daughter Proſerpine, the peculiar patroneſſes of Sicily. Biſhop Blaiſe has ſucceeded to their honours.

At the ſouth-eaſt corner, where the ground, riſing gradually, ends in a bold eminence, which is crowned with majeſtic columns, are the ruins of a temple ſaid to have been conſecrated to Juno. To the weſt of this, ſtands the building commonly called the *Temple of Concord;* the ſtone of which, and the other buildings, is the ſame as that of the neighbouring mountains and cliffs, a conglutination of ſea-ſand and ſhells, full of perforations, of a hard and durable texture, and a deep reddiſh brown colour. This Doric temple has all its columns, entablature, pediments, and walls entire; only part of the roof is wanting. It owes its preſervation to the piety of ſome Chriſtians, who have covered half the nave, and converted it into a church conſecrated under the invocation of St Gregory, biſhop of Girgenti.

Proceeding in the ſame direction, you walk between rows of ſepulchres cut in the rock wherever it admitted of being excavated by the hand of man, or was ſo already by that of nature. Some maſſes of it are hewn into the ſhape of coffins; others drilled full of ſmall ſquare holes employed in a different mode of interment, and ſerving as receptacles of urns. One ponderous piece of the rock lies in an extraordinary poſition; by the failure of its foundation, or the ſhock of an earthquake, it has been looſened from the general quarry, and rolled down the declivity, where it now remains ſupine with the cavities turned upwards. Only a ſingle column marks the confuſed heap of moſs-grown ruins belonging to the temple of Hercules. It ſtood on a projecting rock above a chaſm in the ridge, which was cut through for a paſſage to the emporium.

In the ſame tract, over ſome hills, is ſituated the building uſually called the tomb of Thero. It is ſurrounded by aged olive-trees, which caſt a wild irregular ſhade over the ruin. The edifice inclines to the pyramidical ſhape, and conſiſts at preſent of a triple plinth, and a baſe ſupporting a ſquare pedeſtal: upon this plain ſolid foundation is raiſed a ſecond order, having a window in each front, and at each angle two Ionic pilaſters crowned with an entablature of the Doric order. Its inſide is divided into a vault, a ground room, and one in the Ionic ſtory, communicating with each other by means of a ſmall internal ſtaircaſe.

In the plain are ſeen the fragments of the temple of Eſculapius; part of two columns and two pilaſters, with an intermediate wall, ſupport the end of a farm-houſe, and were probably the front of the cella. Purſuing the track of the walls towards the weſt, you arrive at a ſpot which is covered with the gigantic remains of the temple of Jupiter the Olympian, minutely deſcribed by Diodorus Siculus. It may literally be ſaid that it has not one ſtone left upon another; and it is barely poſſible, with the help of much conjecture, to diſcover the traces of its plan and dimenſions. Diodorus

odorus calls it the largeſt temple in the whole iſland: but adds, that the calamities of war cauſed the work to be abandoned before the roof could be put on; and that the Agrigentines were ever after reduced to ſuch a ſtate of poverty and dependence, that they never had it in their power to finiſh this ſuperb monument of the taſte and opulence of their anceſtors. The length of this temple was 370 Greek feet, its breadth 60, and its height 220, excluſive of the foundations or baſement ſtory; the extent and ſolidity of its vaults and underworks were wonderful; its ſpacious porticos and exquiſite ſculpture were ſuited to the grandeur of the whole. It was not built in the uſual ſtyle of Sicilian temples with a cella of maſſive walls and a peryſtile, but was deſigned in a mixt taſte with half columns let into the walls on the outſide, the inſide exhibiting a plain ſurface.

The next ruin belongs to the temple of Caſtor and Pollux; vegetation has covered the lower parts of the building, and only a few fragments of columns appear between the vines. This was the point of the hill where the wall ſtopt on the brink of a large fiſh-pond ſpoken of by Diodorus: it was cut in the ſolid rock 30 feet deep, and water was conveyed to it from the hills. In it was bred a great quantity of fiſh for the uſe of public entertainments; ſwans and various other kinds of wild fowl ſwam along its ſurface, for the amuſement of the citizens, and the great depth of water prevented an enemy from ſurpriſing the town on that ſide. It is now dry and uſed as a garden On the oppoſite bank are two tapering columns without their capitals, moſt happily placed in a tuft of carob trees. Monte Toro, where Hanno encamped with the Carthaginian army, before the Roman conſuls drew him into an engagement that ruined his defenſive plan, is a noble back-ground to this pictureſque group of objects.—The whole ſpace comprehended within the walls of the ancient city abounds with traces of antiquity, foundations, brick-arches, and little channels for the conveyance of water; but in no part are any ruins that can be preſumed to have belonged to places of public entertainment. This is the more extraordinary, as the Agrigentines were a ſenſual people, fond of ſhews and dramatic performances, and the Romans never dwelt in any place long without introducing their ſavage games. Theatres and amphitheatres ſeem better calculated than moſt buildings to reſiſt the outrages of time; and it is ſurpriſing that not even the veſtiges of their form ſhould remain on the ground.

AGRIMONIA, Agrimony: A genus of the digynia order, belonging to the dodecandria claſs of plants; and in the natural method ranking under the 35th order, *Senticoſæ*. The characters are theſe: The *calyx* is a monophyllous perianthium, divided into five acute ſegments, perſiſtent, and fenced with another calyx: The *corolla* conſiſts of five petals, flat, and crenated at the ends: The *ſtamina* have ten capillary filaments, ſhorter than the corolla, and inſerted into the calyx; the antheræ are ſmall, didymous, and compreſſed: The *piſtillum* has a germen beneath; the ſtyli are two, ſimple, and the length of the ſtamina: There is no *pericarpium;* the calyx is contracted in the neck, and indurated: The ſeeds are two, and roundiſh. Of this genus there are five ſpecies enumerated by botanical writers; but none of them have any remarkable properties except the two following.

Species and properties. 1. The eupatoria, or common agrimony, grows naturally in ſeveral parts of Britain by the ſides of hedges and of woods. It is eat by ſheep and goats, but refuſed by horſes and ſwine. The Canadians are ſaid to uſe an infuſion of the root in burning fevers with great ſucceſs. An infuſion of ſix ounces of the crown of the root in a quart of boiling water, ſweetened with honey, and half a pint of it drank three times a-day, is an effectual cure for the jaundice, according to Dr Hill. He adviſes to begin with a vomit, afterwards to keep the belly ſoluble, and to continue the medicine as long as any ſymptoms of the diſeaſe remain. It is ſaid to be an aperient, detergent, and ſtrengthener of the viſcera. Hence it is recommended in ſcorbutic diſorders, in debility and laxity of the inteſtines, &c. Digeſted in whey, it affords an uſeful diet-drink for the ſpring-ſeaſon, not ungrateful to the palate or ſtomach. Doctor Alſton ſays, that the beſt mode of adminiſtering this herb is in powder, when the intention is to corroborate; and that if thus taken in a large quantity, we may expect many of the effects of the bark from it in agues.

2. The odorata, or ſweet-ſcented agrimony. This grows near four feet high; the leaves have more pinnæ than the former; the ſerratures of the leaves are alſo ſharper, and, when handled, they emit an agreeable odour. The leaves of this ſpecies make an agreeable cooling tea, which is ſometimes preſcribed by phyſicians as a drink for people in fevers.

Culture Both theſe ſpecies may be propogated either by ſeed, or by parting the roots in autumn when the leaves begin to decay. The ſeeds ought alſo to be ſown in this ſeaſon; for if kept out of the ground till ſpring, they ſeldom come up that year.—Agrimony is a hardy perennial plant, and will thrive in almoſt any ſoil or ſituation; but the plants ſhould not be placed nearer one another than two feet, that the roots may have room to ſpread.

Hemp Agrimony. See Eupatorium.

Water Hemp-Agrimony. See Bidens.

AGRIONIA, in Grecian antiquity, feſtivals annually celebrated, by the Bœotians, in honour of Bacchus. At theſe feſtivals, the women pretended to ſearch after Bacchus as a fugitive; and, after ſome time, gave over their inquiry, ſaying, that he was fled to the Muſes, and was concealed among them.

AGRIOPHAGI, in antiquity, a name given to thoſe who fed on wild beaſts. The word is Greek, compounded of αγριος, "wild," "ſavage," and φαγω, "I eat." The name is given, by ancient writers, to certain people, real or fabulous, ſaid to have fed altogether on lions and panthers. Pliny and Solinus ſpeak of *Agriophagi* in Ethiopia, and Ptolemy of others in India on this ſide the Ganges.

AGRIPPA, in midwifery, a term applied to children, brought forth with their feet foremoſt.

Agrippa (Herod), the ſon of Ariſtobulus and Mariamne, and grandſon to Herod the Great, was born in the year of the world 3997, three years before the birth of our Saviour, and ſeven years before the vulgar æra. After the death of Ariſtobulus

Agrippa. lus his father, Josephus informs us, that Herod his grandfather took care of his education, and sent him to Rome to make his court to Tiberius. The emperor conceived a great affection for Agrippa, and placed him near his son Drusus. Agrippa very soon won the graces of Drusus, and of the empress Antonia. But Drusus dying suddenly, all those who had been much about him were commanded by Tiberius to withdraw from Rome, lest the sight and presence of them should renew his affliction. Agrippa, who had indulged his inclination to liberality, was obliged to leave Rome overwhelmed with debts, and in a very poor condition. He did not think it fit to go to Jerusalem, because he was not able to make a figure there suitable to his birth. He retired therefore to the castle of Massada, where he lived rather like a private person than a prince. Herod the Tetrarch, his uncle, who had married Herodias his sister, assisted him for some time with great generosity. He made him principal magistrate of Tiberias, and presented him with a large sum of money: but all this was not sufficient to answer the excessive expences and profusion of Agrippa; so that Herod growing weary of assisting him, and reproaching him with his bad œconomy, Agrippa took a resolution to quit Judea and return to Rome. Upon his arrival, he was received into the good graces of Tiberius, and commanded to attend Tiberius Nero the son of Drusus. Agrippa, however, having more inclination for Caius the son of Germanicus, and grandson of Antonia, chose rather to attach himself to him; as if he had some prophetic views of the future elevation of Caius, who at that time was beloved by all the world. The great assiduity and agreeable behaviour of Agrippa so far engaged this prince, that he kept him continually about him.

Agrippa being one day overheard by Eutyches, a slave whom he had made free, to express his wishes for Tiberius's death and the advancement of Caius, the slave betrayed him to the Emperor; whereupon Agrippa was loaded with fetters, and committed to the custody of an officer. Tiberius soon after dying, and Caius Caligula succeeding him, the new Emperor heaped many favours and much wealth upon Agrippa; changed his iron fetters into a chain of gold; set a royal diadem upon his head; and gave him the tetrarchy which Philip, the son of Herod the Great, had been possessed of, that is, Batanæa and Trachonitis. To this he added that of Lysanias; and Agrippa returned very soon into Judea to take possession of his new kingdom.

Caius being soon after killed, Agrippa, who was then at Rome, contributed much by his advice to maintain Claudius in possession of the imperial dignity, to which he had been advanced by the army. But in this affair Agrippa acted a part wherein he showed more cunning and address than sincerity and honesty; for while he made a show of being in the interest of the senate, he secretly advised Claudius to be resolute, and not to abandon his good fortune. The Emperor, as an acknowledgment for his kind offices, gave him all Judea and the kindom of Chalcis, which had been possessed by Herod his brother. Thus Agrippa became of a sudden one of the greatest princes of the East; and was possessed of as much, if not more, territories than had been held by Herod the Great his grandfather. He returned to Judea, and governed it to the great satisfaction of the Jews. But the desire of pleasing them, and a mistaken zeal for their religion, induced him to commit an unjust action, the memory of which is preserved in Scripture, Acts xii. 1, 2, &c. for about the feast of the passover, in the year of Jesus Christ 44, St James major, the son of Zebedee and brother to St John the Evangelist, was seized by his order and put to death. He proceeded also to lay hands on St Peter, and imprisoned him, waiting till the festival was over, that he might then have him executed. But God having miraculously delivered St Peter from the place of his confinement, the designs of Agrippa were frustrated. After the passover, this prince went from Jerusalem to Cæsarea, and there had games performed in honour of Claudius. Here the inhabitants of Tyre and Sidon waited on him to sue for peace. Agrippa being come early in the morning to the theatre, with a design to give them audience, seated himself on his throne, dressed in a robe of silver-tissue, worked in the most admirable manner. The rising sun darted on it with its rays, and gave it such a lustre as the eyes of the spectators could not endure. When therefore the king spoke to the Tyrians and Sidonians, the parasites around him began to say, that it was the voice of a god, and not that of a man. Instead of rejecting these impious flatteries, Agrippa received them with an air of complacency; but at the same time observed an owl above him on a cord. He had seen the same bird before when he was in bonds by order of Tiberius; and it was then told him, that he should be soon set at liberty: but that whenever he saw the same thing a second time, he should not live above five days afterwards. He was therefore extremely terrified; and he died at the end of five days, racked with tormenting pains in his bowels, and devoured with worms. Such was the death of Herod Agrippa, after a reign of seven years, in the year of Christ 44.

Agrippa II. son of the preceding Herod, was made king of Chalcide; but three or four years after, he was deprived of that kingdom by Claudius, who gave him in the place of it other provinces. In the war Vespasian carried on against the Jews, Herod sent him a succour of 2000 men; by which it appears, that, tho' a Jew by religion, he was yet entirely devoted to the Romans, whose assistance indeed he wanted, to secure the peace of his own kingdom. He lived to the third year of Trajan, and died at Rome A. C. 100. He was the seventh and last king of the family of Herod the Great. It was before him and Berenice his sister, that St Paul pleaded his cause at Cæsarea.

Agrippa (Marcus Vespanius), son-in-law to Augustus, of mean birth, but one of the most considerable generals among the Romans. Augustus's victory over Pompey and Mark Anthony was owing to his counsel: he adorned the city with the pantheon, baths, aqueducts, &c.

Agrippa (Cornelius), born at Cologne in 1486, a man of considerable learning, and by common report a great magician; for the monks at that time suspected every thing of heresy or sorcery which they did not understand. He composed his *Treatise of the Excellence of Women*, to insinuate himself into the favour of Margaret of Austria, governess of the Low-Countries. He accepted of the charge of historiographer to the emperor,

ror, which that princess gave him. The treatise of the *Vanity of the Sciences*, which he published in 1530, enraged his enemies extremely; as did that of *Occult Philosophy*, which he printed soon after at Antwerp. He was imprisoned in France for something he had written against Francis I.'s mother; but was enlarged, and went to Grenoble, where he died in 1534. His works are printed in two volumes octavo.

AGRIPPINA, daughter of Germanicus, sister of Caligula, and mother of Nero; a woman of wit, but excessively lewd. She was thrice married, the last time to Claudius her own uncle, whom she poisoned to make way for Nero her son. Nero afterward caused her to be murdered in her chamber, when she bid the executioner stab her first in the belly that had brought forth such a monster.

AGRIPPINA COLONIA UBIORUM (anc. geog.), now *Cologne*: so called from Agrippina, the daughter of Germanicus, and mother of Nero, who had a colony sent thither at her request by the emperor Claudius, to honour the place of her birth. See COLOGNE.

AGRIPPINIANS, in church-history, the followers of Agrippinus bishop of Carthage, in the third century, who first introduced and defended the practice of rebaptization.

AGROM, a disease frequent in Bengal and other parts of the Indies, wherein the tongue chaps and cleaves in several places, being extremely rough withal, and sometimes covered with white spots. The Indians are very fearful of this disease, which they attribute to extreme heat of the stomach. Their remedy is, to drink some chalybeate liquor, or the juice of mint.

AGROSTEMA, WILD LYCHNIS, or CAMPION: A genus of the pentagynia order, belonging to the decandria class of plants; and in the natural method ranking under the 22d order, *Caryophyllei*. The characters are: The *calyx* is a single-leaved perianthium, leathery, tubular, quinquedentated, and persistent: The *corolla* consists of five ungulated petals: The *stamina* have ten subulated filaments; the antheræ are simple: The *pistillum* has an egg-shaped germen; the styli are five, filiform, erect, and the length of the stamina; the stigmata are simple: The *pericarpium* is an oblong covered capsule, having two cells and five valves: The *seeds* are numerous and kidney-shaped; the receptacula are as many as the seeds, the interior ones gradually longer.

Species. The most remarkable are, 1. The githago, hairy wild lychnis, or common campion, which grows naturally in corn-fields in most parts of Britain. The flowers appear in June, are generally purple, sometimes white, and by cultivation yellow.

2. The coronaria, or single-rose campion. Of this species there are four varieties; one with deep red, another with flesh-coloured, a third with white, flowers; and a sort with double flowers, which has turned most of the others out of the gardens.

3. The flos jovis, or umbelliferous mountain-campion, grows naturally upon the Helvetian mountains. It is a low plant with wooly leaves: the flower-stem rises near a foot high; the flowers grow in umbels on the top of the stalk, and are of a bright red colour. They appear in July, and the seeds ripen in September.

Culture. The first and third species are annual plants, so must be propagated by seeds; but as the first is found naturally in corn-fields, it is very seldom cultivated in gardens; the third sort should have a shady situation, and thrives best in a strong soil. The second species is perennial, but only those varieties which have single flowers produce any seeds; the double kind, therefore, as it produces no seeds, must be propagated by parting the roots in autumn, after the flowers are past. In doing this, every head which can be slipped off with roots should be parted: these should be planted in a border of fresh undunged earth, at the distance of six inches one from the other, observing to water them gently until they have taken root; after which they will require no more; for much wet is very injurious to them, as is also dung. In this border they may remain till spring, when they should be planted in the borders of the flower-garden, where they will be very ornamental during the time of their flowering, which is in July and August.—This plant is eat by horses, goats, and sheep.

AGROSTIS, BENT-GRASS, in botany: A genus of the triandria order, belonging to the digynia class of plants; and, in the natural method, ranking under the 4th order, *Gramina*. The characters are: The *calyx* is a one-flowered, two-valved, pointed gluma, rather less than the corolla. The *corolla* is two-valved and pointed. The *stamina* have three capillary filaments, which are larger than the corolla. The *antheræ* are forked. The *pistillum* has a roundish germen; the styli are two, reflected, and villous; the stigmata hisped longitudinally. The *pericarpium* is the corolla growing to the seed, not gaping. The *seed* is one, globular, and pointed at both ends. There are 15 species; eight of them natives of Britain.

AGROSTOGRAPHIA, signifies the history or description of grasses. See GRASS.

AGROUND, the situation of a ship whose bottom, or any part of it, hangs, or rests upon the ground, so as to render her immoveable, till a greater quantity of water floats her off, or till she is drawn out into the stream by the application of mechanical powers.

AGRYPNIA, among physicians, implies an inaptitude to sleep; a troublesome symptom of feverish and other disorders.

AGRYPNIA, in the Greek church, implies the vigil of any of the greater festivals.

AGUE, a general name for all periodical fevers, which, according to the different times of the returns of the feverish paroxysm, are denominated tertian, quartian, and quotidian. See MEDICINE (*Index.*)

Ague-Cake, the popular name for a hard tumour on the left side of the belly, lower than the false ribs, said to be the effect of intermitting fevers.

Ague-Tree, a name given to the sassafras, on account of its febrifuge qualities.

AGUEPERSE, a town of France, situated on the Lyonnois, about 15 miles north of Clermont.

AGUILLANEUF, or AUGILLANEUF, a form of rejoicing used among the ancient Franks on the first day of the year. The word is compounded of the French *A* "to," *gui* "misleto," and *l'an neuf* "the new year." Its origin is traced from a druid-ceremony: the priests used to go yearly in December, which with them was reputed a sacred month, to gather misleto of the oak in great solemnity. The prophets marched in the front, singing hymns in honour of their deities;

after them came a herald with a caduceus in his hand; these were followed by three druids a-breaft, bearing the things neceffary for facrifice; laft of all came the chief or arch druid, accompanied with the train of people. The chief druid climbing the oak, cut off the miffeto with a golden fickle, and the other druids received it in a white cloth; on the firft day of the year it was diftributed among the people, after having bleffed and confecrated it by crying *A gui l'an neuf*, to proclaim the new year. This cry is ftill continued in Picardy, with the addition of *Plantez*, *Plantez*, to wifh a plentiful year. In Burgundy and fome other parts, the children ufe the fame word to beg a new-year's gift. Of later times the name *Aguillaneuf* was alfo given to a fort of begging, practifed in fome diocefes, for church-tapers, on new-year's day, by a troop of young people of both fexes, having a chief, &c. It was attended with various ridiculous ceremonies, as dancing in the church, &c. which occafioned the fynods to fupprefs it.

AGUILLAR, a town of Spain, in the province of Navarre, about 24 miles weft of Eftella.

Aguillar Del Campo, a town of Old Caftile, with the title of marquifate, about 15 leagues north of the city of Burgos.

AGUILLONIUS (Francis), a Jefuit, born at Bruffels: he was rector of the Jefuits college at Antwerp, and eminent for his fkill in mathematics. He was the firft who introduced that fcience among the Jefuits in the low countries: he wrote a book of Optics, and was employed in finifhing his Catoptrics and Dioptrics, when death prevented him in 1617.

AGUIRRA (Jofeph Sænz de), a Benedictine, and one of the moft learned men of the 17th century, was born March 24. 1630. He was cenfor and fecretary of the fupreme council of the inquifition in Spain, and interpreter of the fcriptures in the univerfity of Salamanca. He printed three volumes in folio upon Philofophy, a commentary upon Ariftotle's ten books of Ethics, and other pieces. He died at Rome Auguft 19. 1699.

AGUL, in botany, a fynonime of the hedyfarum. See Hedysarum.

AGUR. The xxxth chapter of the Proverbs begins with this title: "The words of Agur, the fon of Jakeh;" which, according to the fignification of the original terms, may be tranflated, as the Vulgate has it, *Verba congregantis, filii vomentis*; which tranflation Le Clerc condemns, fuppofing thefe to be proper names, which ought not to be tranflated. Thefe words are rendered by Lewis de Dieu: "The words of him who has recollected himfelf, the fon of obedience." The generality of the fathers and commentators will have it, that Solomon defcribes himfelf under the name of Agur the fon of Jakeh; others conjecture that Agur, as well as Lemuel (in chap. xxxi. 1.) were wife men who lived in the time of Solomon, and were his interlocutors in the book of Proverbs; an opinion which F. Calmet thinks is without the leaft fhew of probability, this book being nothing like a dialogue. This laft expofitor thinks it probable, that Agur was an infpired author different from Solomon, whofe fentences it was thought fit to join with thofe of this prince, becaufe of the conformity of their matter.

AGURAH, in Jewifh antiquity, the name of a filver coin, otherwife called *gerah* and *kefhita*.

AGURIUM, or Agyrium (anc. geog.), a town of Sicily in the Val di Demona, near the river Semetus. The people were called *Populus Agyrinenfis* by Cicero; *Agyrinus* by Pliny. It was the birth-place of Diodorus Siculus, as he himfelf teftifies; but he calls it *Argyrium*, as it is now called *S. Philippo d'Argirone*, which modern name feems to confirm that *Argyrium* is the true reading.

AGUSADURA, in ancient cuftoms, a fee due from vaffals to their lord for the fharpening their ploughing tackle. Anciently the tenants in fome manors were not allowed to have their rural implements fharpened by any but whom the lord appointed; for which an acknowledgment was to be paid, called *Agufadura*, in fome places *Agufage*: which fome take to be the fame with what was otherwife called *Reillage*, from the ancient French *reille*, a ploughfhare.

AGUTI, in zoology, the trivial name of a fpecies of the moufe, belonging to the mammalia glires of Linnæus. See Mus.

AGYEI, in antiquity, a kind of obelifks, facred to Apollo, erected in the veftibles of houfes, by way of fecurity.

AGYNIANI, in church-hiftory, a fect who condemned all ufe of flefh, and marriage, as not inftituted by God, but introduced at the inftigation of the devil. The word is compounded of the privative α and γυνη *woman*. They are fometimes alfo called *Agynnenfes*, and *Agynii*; and are faid to have appeared about the year 694. It is no wonder they were of no long continuance. Their tenets coincide in a great meafure with thofe of the Abelians, Gnoftics, Cerdonians, and other preachers of chaftity and abftinence.

AGYRTÆ, in antiquity, a kind of ftrolling impoftors running about the country, to pick up money by telling fortunes at rich mens doors, pretending to cure difeafes by charms, facrifices, and other religious myfteries; alfo to expiate the crimes of their deceafed anceftors, by virtue of certain odours and fumigations; to torment their enemies, by the ufe of magical verfes and the like. The word is Greek Αγυρται, formed of the verb αγυρω, *I congregate*; alluding to the practice of Charletans, who gather a crowd about them.

Agyrtæ, among the Greeks, amount to the fame with *Ærufcatores* among the Latins, and differ not much from Gypfies among us.

AHAB, fon of Omri king of Ifrael, fucceeded his father A. M. 3086, and furpaffed all his predeceffors in impiety and wickednefs. He married Jezebel the daughter of Ethbaal king of the Zidonians, who introduced the idols of Baal and Aftarte among the Ifraelites, and engaged Ahab in the worfhip of thefe falfe deities. God, being provoked by the fins of Ahab, fent the prophet Elijah to him (1 Kings xvii. 1, *feq.*) who declared to him, that there would be a famine of three years continuance. The dearth having lafted three years, the prophet defired Ahab to gather all the people to mount Carmel, and with them the prophets of Baal: when they were thus affembled, Elijah caufed fire to defcend from heaven upon his facrifice, after which he obtained of God that it fhould rain; and then the earth recovered its former fertility. Six years after this, Ben-hadad king of Syria (chap.

Ahab. xx.) laid siege to Jerusalem. But God, provoked at this proud Syrian, sent a prophet to Ahab, not only to assure him of victory, but to instruct him likewise in what manner he was to obtain it. Ahab was ordered to review the princes of the provinces, which he found to be a choice company consisting of 232 young men, who were to command the people in Samaria, amounting to about 7000 men: with this small army Ahab was directed to fall upon the great host of the Syrians, and that at noon-day, while Ben-hadad and the 32 kings that accompanied him were drinking and making merry. Ben-hadad having notice that they were marching out of the city, ordered them to be brought before him alive, whatever their designs were: but the young men, followed by this small army, advanced, and killing all that opposed them, such a panic seized the Syrian troops, that they began to fly; and even Ben-hadad himself mounted his horse and fled with his cavalry; which Ahab perceiving, pursued them, killed great numbers of them, and took a considerable booty. After this the prophet came to Ahab, to animate him with fresh courage, and to caution him to keep upon his guard; assuring him, that Ben-hadad would return against him the year following. According to this prediction, at the end of the year he returned and encamped at Aphek, with a resolution to give the Israelites battle. Both armies being ranged in order of battle for seven days successively, at length, upon the seventh day, a battle ensued, wherein the Israelites killed 100,000 of the Syrians, and the rest fled to Aphek; but as they were pressing to get into the city, the walls of Aphek fell upon them and killed 27,000 more. Ben-hadad throwing himself upon the mercy of Ahab, this prince received him into his own chariot, and made an alliance with him. The year following, Ahab desiring to make a kitchen-garden near his palace (chap. xxi.), requested of one Naboth, a citizen of Jezreel, that he would sell him his vineyard, because it lay convenient for him. But being refused, he returned in great discontentment to his house, threw himself upon the bed, turned towards the wall, and would eat nothing. Jezebel his wife coming in, asked the reason of his great concern; of which being informed, she procured the death of Naboth, and Ahab took possession of his vineyard. As he returned from Jezreel to Samaria, the prophet Elijah met him, and said, "Hast thou killed and also taken possession? Now saith the Lord, In the place where dogs licked up the blood of Naboth, shall dogs lick thy blood, even thine. As for Jezebel, of her the Lord spake, saying, The dogs shall eat Jezebel by the way of Jezreel." Ahab, hearing these and other denunciations, rent his clothes, put sackcloth upon his flesh, and gave other indications of his sorrow and repentance. But his repentance was neither sincere nor persevering. Two years after these things, Jehoshaphat king of Judah came to Samaria to visit Ahab (chap. xxii.) at a time when he was preparing to attack Ramoth-gilead, which Ben-hadad king of Syria unjustly with-held from him. The king of Israel invited Jehoshaphat to accompany him in this expedition; which that prince agreed to do, but desired that some prophet might first be consulted. Ahab therefore assembled the prophets of Baal, in number about 400; who all concurred in exhorting the king to march resolutely against Ramoth-gilead. But Micaiah being also consulted, at Jehoshaphat's suggestion, prophesied the ruin of Ahab. Upon this, Ahab gave orders to his people to seize Micaiah, and to carry him to Amon the governor of the city, and to Joash the king's son; telling them in his name, "Put this fellow in prison, and feed him with the bread of affliction, and with the water of affliction, until I come in peace." But Micaiah said, "If thou return at all in peace, the Lord hath not spoken by me." Ahab therefore and Jehoshaphat marched up to Ramoth-gilead; and the king of Israel said unto Jehoshaphat, "I will disguise myself, and enter into the battle, but put thou on thy robes:" for he knew that the king of Syria had commanded two and thirty captains that had rule over his chariots, saying, "Fight neither with small nor with great, save only with the king of Israel." These officers therefore having observed that Jehoshaphat was dressed in royal robes, took him for the king of Israel, and fell upon him with great impetuosity: but this prince seeing himself pressed so closely, cried out; and the mistake being discovered, the captains of the king of Syria gave over pursuing him. But one of the Syrian army shot a random arrow, which pierced the heart of Ahab. The battle lasted the whole day, and Ahab continued in his chariot with his face turned towards the Syrians. In the mean time, his blood was still issuing from his wound, and falling in his chariot; and towards the evening he died: whereupon proclamation was made by sound of trumpet, that every man should return to his own city and country. The king of Israel being dead, was carried to Samaria and buried: but his chariot and the reins of his horses were washed in the fish-pool of Samaria, and the dogs licked his blood, according to the word of the prophet. Such being the end of Ahab; his son Ahaziah succeeded him, in the year of the world 3107.

Ahab ‖ Ahaz.

AHÆTULA, the trivial name of a species of the coluber. See COLUBER.

AHASUERUS, or ARTAXERXES, the husband of Esther; and according to archbishop Usher and F. Calmet, the scripture name for Darius, the son of Hystaspes, king of Persia; though Scaliger will have Xerxes to be the husband of Esther, or the Ahasuerus of scripture; and Dr Prideaux believes him to be Artaxerxes Longimanus. See History of PERSIA.

AHAZ, king of Judah, the son of Jotham, remarkable for his vices and impieties. One of his sons he consecrated, by making him pass through and perish by the fire, in honour of the false god Moloch; and he offered sacrifices and incense upon the high places, upon hills, and in groves. Rezin king of Syria and Pekah king of Israel invaded Judea in the beginning of the reign of Ahaz; and having defeated his army and pillaged the country, they laid siege to Jerusalem. When they found that they could not make themselves masters of that city, they divided their army, plundered the country, and made the inhabitants prisoners of war. Rezin and his part of the confederate army marched with all their spoil to Damascus; but Pekah with his division of the army having attacked Ahaz, killed 120,000 men of his army in one battle, and carried away men, women, and children, without distinction, to the number of 200,000. But as they were carrying those captives to Samaria, the prophet Oded, with the principal inhabitants of the

city,

city, came out to meet them; and by their remonſtrances prevailed with them to ſet their priſoners at liberty. At the ſame time, the Philiſtines and Edomites invaded other parts of his land, killed multitudes of the people, and carried off much booty. In this diſtreſſed condition, Ahaz finding no other remedy for his affairs, ſent ambaſſadors to Tiglath-pileſer king of the Aſſyrians; and to engage him to his intereſt, he ſtripped the temple and city of all the gold which he could meet with, and ſent it as a preſent. Accordingly Tiglath-pileſer marched to the aſſiſtance of Ahaz, attacked Rezin and killed him, took his capital Damaſcus, deſtroyed it and removed the inhabitants thereof to Cyrene.

The misfortunes of this prince had no influence to make him better: on the contrary, in the times of his greateſt affliction, he ſacrificed to the Syrian deities, whom he looked upon as the authors of his calamities, and endeavoured to render propitious to him, by honouring them in this manner. He broke in pieces the veſſels of the houſe of God, ſhut up the gates of the temple, and erected altars in all parts of Jeruſalem. He ſet up altars likewiſe in all the cities of Judah, with a deſign to offer incenſe on them. At length he died, and was buried in Jeruſalem, but not in the ſepulchres of the kings of Judah his predeceſſors; which honour he was deprived of, on account of his iniquitous courſe of life. Hezekiah his ſon ſucceeded him in the year of the world 3278, before Jeſus Chriſt 726.

AHAZIAH, the ſon and ſucceſſor of Ahab king of Iſrael, reigned two years, part alone, and part with his father Ahab, who ordained him his aſſociate in the kingdom a year before his death. Ahaziah imitated his father's impieties (1 Kings xxii. 52, ſeq.), and paid his adoration to Baal and Aſtarte, the worſhip of whom had been introduced in Iſrael by Jezebel his mother. The Moabites, who had been always obedient to the kings of the ten tribes ever ſince their ſeparation from the kingdom of Judah, revolted after the death of Ahab, and refuſed to pay the ordinary tribute. Ahaziah had not leiſure or power to reduce them (2 Kings i. 1, 2, &c.): for about the ſame time, having fallen through a lattice from the top of his houſe, he hurt himſelf conſiderably, and ſent meſſengers to Ekron, in order to conſult Baalzebub, the god of that place, whether he ſhould recover of the indiſpoſition occaſioned by this accident. But the prophet Elijah went to Ahaziah, and declared that he ſhould not recover from his illneſs: and accordingly he died in the year of the world 3108, and Jehoram his brother ſucceeded to the crown.

AHAZIAH, king of Judah, the ſon of Jehoram and Athaliah, ſucceeded his father in the kingdom of Judah in the year of the world 3119. He walked in the ways of Ahab's houſe, to which he was allied, his mother being of that family. He reigned only one year, being ſlain by Jehu the ſon of Nimſhi.

AHEAD, a ſea-term, ſignifying further onward than the ſhip, or at any diſtance before her, lying immediately on that point of the compaſs to which her ſtem is directed. It is uſed in oppoſition to *aſtern*, which expreſſes the ſituation of any object behind the ſhip. See ASTERN.

AHICCYATLI, in zoology, the Indian name of a ſerpent reſembling the rattle-ſnake, only it wants the rattles. It is as fatal in the effect of its poiſon as any known ſpecies of ſerpent.

AHIJAH, the prophet of Shilo. He is thought to be the perſon who ſpoke twice to Solomon from God, once while he was building the temple (1 Kings vi. 11.), at which time he promiſed him his protection; and at another time (*id.* xi. 6.) after his falling into all his irregularities, when God expreſſed his indignation with great threatenings and reproaches. Ahijah was one of thoſe who wrote the annals or hiſtory of this prince (2 Chr. ix. 29.). The ſame prophet declared to Jeroboam that he would uſurp the kingdom (1 Kings xi. 29, &c.), and that two heifers ſhould alienate him from the Lord, meaning the golden calves erected by Jeroboam, one at Dan, the other at Bethel. About the end of Jeroboam's reign, towards the year of the world 3046, Abijah the ſon of that prince fell ſick; upon which Jeroboam ſent his wife to this prophet to inquire what would become of the child. The queen therefore went to Ahijah's houſe in Shilo, diſguiſed: But the prophet, upon hearing the ſound of her feet, ſaid, "Come in, thou wife of Jeroboam, why feigneſt thou thyſelf to be another? for I am ſent to thee with heavy tidings." Then he commanded her to go and tell Jeroboam all the evil that the Lord had declared he would bring upon his houſe for his impieties; that ſo ſoon as ſhe would enter into the city her ſon Abijah ſhould die, and ſhould be the only one of Jeroboam's houſe that ſhould come to the grave or receive the honours of a burial. Ahijah in all probability did not long ſurvive the time of this laſt prophecy; but with the time and manner of his death we are not acquainted.

AHITOPHEL, a native of Gillo, was for ſome time the counſellor of king David, whom he at length deſerted, by joining in the rebellion of Abſalom. This prince, upon his being preferred to the crown by the greateſt part of the Iſraelites, ſent for Ahitophel from Gillo (2 Sam. xv. 12.) to aſſiſt him with his advice in the preſent ſtate of his affairs: for at that time Ahitophel's counſels were received as the oracles of God himſelf (chap. xvi. *ult.*). Nothing gave David more uneaſineſs than this event; and when Huſhai his friend came to wait on him and attend him in his flight, he intreated him to return rather to Jeruſalem, make a ſhow of offering his ſervices to Abſalom, and endeavour to fruſtrate the prudent meaſures which ſhould be propoſed by Ahitophel. When Abſalom was come to Jeruſalem, he deſired Ahitophel to deliberate with his other counſellors upon the meaſures which were proper for him to take. Ahitophel adviſed him in the firſt place to abuſe his father's concubines; ſo that when his party ſhould underſtand that he had diſhonoured his father in this manner, they might conclude that there were no hopes of a reconciliation, and therefore eſpouſe his intereſt more reſolutely. A tent, therefore, being prepared for this purpoſe upon the terraſs of the king's palace, Abſalom, in the ſight of all Iſrael, lay with his father's concubines. The next thing Ahitophel propoſed was in the terms following: "Let me now chooſe out 12,000 men, and I will ariſe and purſue after David this night, and I will come upon him while he is weary and weak-handed, and I will make him

him afraid, and all the people that are with him ſhall flee, and I will ſmite the king only; and I will bring back all the people unto thee; the man whom thou ſeekeſt is as if all returned; ſo all the people ſhall be in peace." This advice was very agreeable to Abſalom and all the elders of Iſrael. However, Abſalom deſired Huſhai to be called to have his opinion. Huſhai being come, and hearing what advice Ahitophel had given, ſaid, The counſel which Ahitophel has given is not good at this time; what, for the preſent, in my opinion, may do better, is this: Let all Iſrael be gathered unto thee, from Dan even to Beerſheba, as the ſand that is by the ſea for multitude, and put thyſelf in the midſt of them, and wherever David is, we may fall upon him, and overwhelm him with our numbers, as the dew falleth upon the ground. This laſt advice being more agreeable to Abſalom and all the elders of Iſrael, was preferred; upon which Ahitophel ſaddled his aſs, went to his houſe at Gillo, hanged himſelf, and was buried in the ſepulchre of his fathers. He foreſaw, without doubt, all that would happen in conſequence of Huſhai's advice, and was determined to prevent the death which he had deſerved, and which David would probably have inflicted on him, as ſoon as he ſhould be reſettled on his throne.

AHMELLA, in botany. See Bidens.

AHOLIBAH and Aholah, are two feigned names made uſe of by Ezekiel (xxiii. 4.) to denote the two kingdoms of Judah and Samaria. Aholah and Aholibah are repreſented as two ſiſters of Egyptian extraction. Aholah ſtands for Samaria, and Aholibah for Jeruſalem. The firſt ſignifies a *tent*; and the ſecond, *my tent is in her*. They both proſtituted themſelves to the Egyptians and Aſſyrians, in imitating their abominations and idolatries: for which reaſon they were abandoned to thoſe very people for whom they had ſhown ſo paſſionate and ſo impure an affection; they were carried into captivity, and reduced to the ſevereſt ſervitude.

AHOUAI, in botany, a ſynonime and alſo the trivial name of a ſpecies of Cerbera.

A-HULL, in the ſea-language, the ſituation of a ſhip when all her ſails are furled on account of the violence of the ſtorm, and when having laſhed her helm on the lee-ſide, ſhe lies nearly with her ſide to the wind and ſea, her head being ſomewhat inclined to the direction of the wind.

AHUN, a town in France, in the Upper Marche and generality of Moulins, and is a royal juriſdiction. It is ſeated on the river Creuſe, near a Benedictine abbey of the ſame name, eight miles ſouth-eaſt of Gueret, 30 north-eaſt of Lomages, and 55 ſouth-eaſt of Moulins. E. Long. 2. 8. N. Lat. 49. 5.

AHUYS, a town of Sweden. It is ſmall, but very ſtrong by its ſituation, and has a good port. It is in the principality of Gothland, in the territory of Bleckingy, near the Baltic ſea, about 18 miles from Chriſtianſtadt. E. Long. 14. 10. N. Lat. 56. 20.

AI, (anc. geog.) a town in Judea, to the north of Jericho, called Αινα by Joſephus, and the inhabitants *Ainatæ*. Joſhua having ſent a detachment of 3000 men againſt Ai, God permitted them to be repulſed on account of Achan's ſin, who had violated the anathema pronounced againſt the city of Jericho. But after the expiation of this offence, God commanded Joſhua (chap. viii.) to march with the whole army of the Iſraelites againſt Ai, and treat this city and the kingdom thereof as he had treated Jericho, with this difference, that he gave the plunder of the town to the people. Joſhua ſent by night 30,000 men to lie in ambuſh behind Ai; having firſt well inſtructed thoſe who had the command of them in what they were to do; and the next day, early in the morning, he marched againſt the city with the remainder of his army. The king of Ai perceiving them, ſallied haſtily out of the town with all his people, and fell upon the forces of the Iſraelites; who upon the firſt onſet fled, as if they had been under ſome great terror.

As ſoon as Joſhua ſaw the enemy all out of the gates, he raiſed his ſhield upon the top of a pike, which was the ſignal given to the ambuſcade; whereupon they immediately entered the place, which they found without defence, and ſet fire to it. The people of Ai perceiving the ſmoke aſcending, were willing to return, but diſcovered thoſe who had ſet fire to the city in their rear, while Joſhua and thoſe who were with him turning about, fell upon them, and cut them in pieces. The king was taken alive, and afterwards put to death.

The chevalier Folard obſerves, that Joſhua's enterpriſe on Ai, excepting in ſome particulars of military art, is very like that of Gibeah, which is ſcarce any thing more than a copy of it. It would appear, ſays that writer, by the ſcripture account, that Joſhua was not the author of the ſtratagem made uſe of by him: for when God directs himſelf to Joſhua, he ſays, 'Go 'up againſt Ai; lay an ambuſcade behind the town; I 'have delivered the king and the people of it into thine 'hands:' yet notwithſtanding this, God might leave the whole glory of the invention and execution of it to him, as to a great general. 'Joſhua aroſe,' ſays the ſacred author, 'and all the people of war, to go up a'gainſt Ai (verſe 3.); and Joſhua choſe out 30,000 'mighty men of valour, and ſent them away by night.' Folard remarks, that there is a manifeſt contradiction between this verſe and the 12th, wherein it is ſaid, that Joſhua choſe out 500 men, whom he ſent to lie in ambuſh, between Bethel and Ai. How is this to be reconciled? Calmet ſays, that Maſius allows but 5000 men for the ambuſcade, and 25,000 for the attack of the city, being perſuaded that an army of 600,000 men could only create confuſion on this occaſion, without any neceſſity for, or advantage in, ſuch numbers: but the generality of interpreters, continues Calmet, acknowledge two bodies to be placed in ambuſcade, both between Bethel and Ai; one of 25,000, and the other of 5000 men.

With regard to the ſignal Joſhua made to that part of his army which lay in ambuſcade, the learned Folard embraces the opinion of the Rabbins, who believe what is called the ſhield to be too ſmall to ſerve for a ſignal: hence they make it to be the ſtaff of one of their colours: from this, our author concludes, that the whole colours were uſed on the occaſion; for in the Aſiatic ſtyle, which is very near the poetic, the part is oftentimes to be taken for the whole.

AJALON, (anc. geog.) a town of the tribe of Dan, one of the Levitical. Another in the tribe of Benjamin, in whoſe valley Joſhua commanded the moon to ſtand ſtill, being then in her decreaſe, and con-

consequently to be seen at the same time with the sun.

AJAN, a coast and country of Africa, has the river Quilmanci on the south; the mountains from which that river springs, on the west; Abyssinia, or Ethiopia, and the straight of Babelmandel, on the north; and the eastern, or Indian ocean, on the east. The coast abounds with all necessaries of life, and has plenty of very good horses. The kings of Ajan are often at war with the emperor of the Abyssins; and all the prisoners they take they sell to the merchants of Cambaya, those of Aden, and other Arabs, who come to trade in their harbours, and give them in exchange, coloured cloths, glass-beads, raisins, and dates; for which they also take back, besides slaves, gold and ivory. The whole sea-coast, from Zanguebar to the straight of Babelmandel, is called the coast of Ajan; and a considerable part of it is styled the Desert-coast.

AJAX, the son of Oileus, was one of the principal generals that went to the siege of Troy: he ravished Cassandra the daughter of Priam, even in the temple of Minerva, where she thought to have found sanctuary. It is said, he made a serpent of fifteen feet long so familiar with him, that it eat at his table, and followed him like a dog. The Locrians had a singular veneration for his memory.

Ajax, the son of Telamon, was, next to Achilles, the most valiant general among the Greeks at the siege of Troy: he commanded the troops of Salamis, and performed many great actions, of which we have an account in the Iliad, in *Dictys Cretensis*, and in the 23d book of Ovid's Metamorphoses. He was so enraged that the arms of Achilles were adjudged to Ulysses, that he immediately became mad. The Greeks paid great honours to him after his death, and erected a magnificent monument to his memory upon the promontory of Rhetium.

Ajax, in antiquity, a furious kind of dance, in use among the Grecians; intended to represent the madness of that hero after his defeat by Ulysses, to whom the Greeks had given the preference in his contest for Achilles's arms. Lucian, in his treatise of Dancing, speaks of dancing the *Ajax*.—There was also an annual feast called *Ajantia*, Αιαντεια, consecrated to that prince, and observed with great solemnity in the island of Salamis, as well as in Attica; where, in memory of the valour of Ajax, a bier was exposed, set out with a complete set of armour.

AJAZZO, a sea-port town of the island of Corsica, in the Mediterranean, with a bishop's see. Long. 26. 35. Lat. 41. 40.

Ajazzo, a sea-port town of Natolia, in the province of Caramania, anciently Silesia, seated on the coast of the Mediteranean, 30 miles north of Antioch and 50 west of Aleppo, where the city of Issus anciently stood, and near which Alexander fought his second battle with Darius. Long. 33. 10. Lat. 37. 0.

AICHSTAT, a town of Germany, in Franconia, and capital of a bishopric of the same name. It is remarkable for a curious piece of workmanship, called the sun of the Holy Sacrament, which is in the church: it is of massy gold, of great weight, and is enriched with 350 diamonds, 1400 pearls, 250 rubies, and other precious stones. This place is moderately large, and seated in a valley on the river Altmul, 10 miles N. of Newburgh, and 37 S. of Nuremberg. E. Lon. 11. 10. N. Lat. 49. 0. The bishopric is 45 miles in length and 17 in breadth; and the bishop is chancellor of the church of Mayence or Mentz.

AICUROUS, a species of parrot. See Psittacus.

AID, in a general sense, denotes any kind of assistance given by one person to another.

Aid, in law, denotes a petition made in court to call in help from another person who has interest in land, or any other thing contested.

Aid-de-camp, in military affairs, an officer employed to receive and carry the orders of a general.

Aid, *Auxilium*, in ancient customs, a subsidy paid by vassals to their lords on certain occasions. Such were the aid of relief, paid upon the death of the Lord Mesne to his heir; the *aid cheval*, or capital aid, due to the chief lord on several occasions, as, to make his eldest son a knight, to make up a portion for marrying his daughter, &c.

AIDS, in the French customs, certain duties paid on all goods exported or imported into that kingdom.

Court of Aids, in France, a sovereign court established in several cities, which has cognizance of all causes relating to the taxes, gabelles, and aids, imposed on several sorts of commodities, especially wine.

Aids, in the manege, are the same with what some writers call *cherishings*, and used to avoid the necessity of corrections.—The inner heel, inner leg, inner rein, &c. are called *inner aids*; as the outer heel, outer leg, outer rein, &c. are called *outer aids*.

AIDAN, a famous Scottish bishop of Lindisfarne, or Holy Island, in the 7th century, was employed by Oswald king of Northumberland in the conversion of the English, in which he was very successful. He died in 651.

AIGHENDALE, the name of a liquid measure used in Lancashire, containing seven quarts.

AIGLE, a bailiwick in the territory of Romand in Swisserland, consists of mountains and valleys, the principal of which are the Aigle and Bex. Through these is the great road from Vallais into Italy. When you pass by Villeneuve, which is at the head of the lake of Geneva, you enter into a deep valley three miles wide, bordered on one side with the Alps of Swisserland, and on the other with those of Savoy, and crossed by the river Rhone. Six miles from thence you meet with Aigle, a large town, seated on a wide part of the valley, where there are vineyards, fields, and meadows. The governor's castle is on an eminence that overlooks the town, and has a lofty marble tower. This government has nine large parishes; and is divided into four parts, Aigle, Bex, Olon, and Ormont. This last is among the mountains, and joins to Rougement. It is a double valley, abounding in pasture-lands. Ivorna, in the district of Aigle, was in part buried by the fall of a mountain, occasioned by an earthquake in 1584.

Aigle, a small town, in France, in Upper Normandy, twenty-three miles from D'Evereux, and thirty-eight from Rouen. It is surrounded with walls and ditches, has six gates, three suburbs, and three parishes. It trades in corn, toys, and more particularly in needles and pins. E. Long. 1. 5. N. Lat. 48. 35.

AIGUILLON, a small town of France in the province of Guienne, situated at the conflux of the rivers Garonne and Lot.

AIGUISCE, in heraldry, denotes a croſs with its four ends ſharpened, but ſo as to terminate in obtuſe angles.—It differs from the croſs fitchee, in as much as the latter tapers by degrees to a point, and the former only at the ends.

AILANA, Ailath, or Aheloth, anciently a town of Arabia Petræa, ſituated near the Sinus Elanites of the Red Sea. It was alſo called *Elath*, and *Eloth*, (Stephanus, Strabo, Moſes.) The ſame with *Elana*.

AILE, in law, a writ which lies where a perſon's grandfather, or great-grandfather, being ſeiſed of lands, &c. in fee-ſimple, the day that he died, and a ſtranger abates and enters the ſame day, and diſpoſſeſſes the heir of his inheritance.

AILESBURY, Aylesbury, or Alesbury, a borough town in Buckinghamſhire, conſiſting of about 400 houſes. It conſiſts of ſeveral ſtreets, though the houſes are not very contiguous: theſe lie round about the market-place, in the middle of which is a convenient hall, where the ſeſſions are held, and ſometimes the aſſizes for the county. It ſends two members to Parliament; has a market on Saturdays; and three fairs for cattle, viz. on the Saturday before Palmſunday, June 14th, and September 25th. It is ſixty miles ſouth-eaſt of Buckingham, and forty-four northweſt of London. W. Long. 0. 40. N. Lat. 51. 40.

AILMER, or Æthelmare, Earl of Cornwall and Devonſhire, in the reign of king Edgar. It is not known of what family he was. His authority and riches were great, and ſo alſo in appearance was his piety. He founded the abbey of Cerne, in Dorſetſhire; and had ſo great a veneration for Eadwald, the brother of St Edmund the martyr, who had lived a hermit in that country, near the ſilver well, as they called it, that, with the aſſiſtance of Archbiſhop Dunſtan, he tranſlated his relics to the old church of Cernel. In 1016, when Canute, the ſon of Suane, invaded England, and found himſelf ſtoutly oppoſed by that valiant Saxon prince Edmund Ironſide, the ſon of Æthelred, this Earl Ailmer, with that arch traitor Eadric Streone, Earl of Mercia, and Earl Algar, joined the Dane againſt their natural prince, which was one great cauſe of the Saxons ruin. He did not long ſurvive this; and we find mentioned in hiſtory only one ſon of his, whoſe name was Æthelward, Earl of Cornwall, who followed his father's maxims, and was properly rewarded for it. For in 1018, Canute reaping the benefit of their treaſons, and perceiving that the traitors were no longer uſeful, he cauſed the infamous Eadric Streone, and this Earl Æthelward, to be both put to death.

AILRED, or Ealred, abbot of Reveſby in Lincolnſhire, in the reigns of Stephen and Henry II. He was born in 1109, of a noble family, and educated in Scotland with Henry the ſon of king David. On his return to England, he became a monk of the Ciſtertian order, in the monaſtery of Reveſby, of which he afterwards was made Abbot. He died on the 12th of January 1166, aged 57, and was buried in his monaſtery. "He was (ſays Leland) in great eſteem during his life; celebrated for the miracles wrought after his death; and admitted into the catalogue of ſaints." He was author of ſeveral works; moſt of which were publiſhed by Gilbo the Jeſuit at Douay, 1631; part of them may be alſo found in the *Bibliotheca Ciſtertienſis*, and *Bibliotheca Patrum*. His principal works is the *Speculum charitatis*. Leland, Bale, and Pits, mention ſeveral manuſcripts which never were publiſhed.

AILSA, an inſulated rock on the weſtern coaſt of Scotland, between the ſhores of Airſhire and Cantire. It is two miles in circumference at the baſe, is acceſſible only at one place, and riſes to a great height in a pyramidical form. A few goats and rabbits pick up a ſubſiſtence among the ſhort graſs and furze; but the importance of the rock conſiſts in the great variety and boundleſs numbers of birds, by which it is frequented, particularly the gannets or ſolan-geeſe, whoſe young are uſed at the beſt tables, and bring a good price. Other birds are caught for their feathers. The rock is rented from the Earl of Caſſilis at L. 33 *per annum*. The depth of water around the baſe is from 7 to 48 fathoms. It is ſurrounded with excellent banks, well ſtocked with cod and other white fiſh.

AINSWORTH (Dr Henry), an eminent nonconformiſt divine, who, about the year 1590, diſtinguiſhed himſelf among the Browniſts; which drew upon him ſuch troubles that he was obliged to retire to Holland, and became miniſter of a church at Amſterdam. His ſkill in the Hebrew language, and his excellent Annotations on the Holy Scriptures, which are ſtill highly eſteemed, gained him great reputation. He alſo wrote ſeveral pieces in defence of the Browniſts, and ſeveral other works.

Ainsworth (Robert), born at Woodyale in Lancaſhire in 1660, was maſter of a boarding-ſchool at Bethnal-green, from whence he removed to Hackney, and to other places in the neighbourhood of London. After acquiring a moderate fortune, he retired, and lived privately till the time of his death, which happened in 1743. We are indebted to him for the beſt Latin and Engliſh Dictionary extant: he publiſhed it in quarto 1736; and in 1752, the fourth edition, under the care of Doctor Ward of Greſham College, and the Rev. William Younge, was enlarged to two vols folio.

AIR, in natural philoſophy, a thin, fluid, elaſtic, tranſparent, ponderous, compreſſible, and dilatable body, ſurrounding the terraqueous globe to a conſiderable height. See Aerology, Atmosphere, and Pneumatics.

Impregnation of Water with Fixed Air, *and with Sulphureous* Air. See Mineral *Waters*.

Air, in Medicine, &c. makes one of the ſix nonnaturals.—From obſervations on bleeding in rheumatiſms, and after taking cold, it is evident, the air can enter with all its qualities, and vitiate the whole texture of the blood, and other juices.—From the palſies, vertigoes, and other nervous affections cauſed by damps, mines, &c. it is evident, that air thus qualified can relax and obſtruct the whole nervous ſyſtem. And from the colics, fluxes, coughs, and conſumptions produced by damp, moiſt, and nitrous air, it is evident it can corrupt and ſpoil the noble organs, &c.

Circulation of Air *in Rooms*. To render the circulation of air ſenſible, let the air of a room be heated by a ſtrong fire, whilſt the air of a contiguous room is cold; then let the door between theſe two rooms be opened, in which caſe the hot air of one room being lighter, will paſs through the upper part of the opening of the door into the cold room; and, on the contrary, the cold

cold air of the other room being heavier, will paſs into the former room through the lower part of the opening; accordingly, it will be found, that applying a lighted candle at the top, in the middle, and at the lower part of the opening between the two rooms, a ſtrong current of air will appear to paſs from the hot into the cold room near the top; a contrary current of air will appear to paſs from the latter into the former room near the lower part of the ſaid opening; whilſt in the middle there is little or no motion at all, as may be clearly perceived by the direction of the flame of the candle.

It is for the ſame reaſon that when the fire is lighted in a chimney, a ſtrong current of air is occaſioned to enter the room, which may be felt by applying the hand near the key-hole, or other ſuch ſmall openings, if the doors and windows are ſhut; for the air over the fire being heated, becomes lighter, and aſcends into the chimney, conſequently other colder air muſt ſupply its place, which forces its way through all the ſmall openings it can find. Were a room with a fire in it to be perfectly cloſed, excepting the chimney, the air in it would ſoon become unwholeſome for reſpiration, and the fire would be ſoon extinguiſhed, beſides other inconveniences. Hence it appears, that thoſe perſons miſtake who expect to keep the air of a room ſweet and wholeſome, eſpecially for convaleſcents, by accurately ſtopping all the ſmalleſt openings that admit freſh air. When the current of air that enters into a room is on ſome ſide of it where it falls immediately upon the perſons who ſit in the room, then it may be offenſive, eſpecially to delicate conſtitutions. In that caſe, ſuch opening ſhould be cloſed: but at the ſame time another opening ſhould be made for admitting freſh air, in another more convenient part; for a circulation of air, eſpecially in rooms where a fire is kept, is not only ſalutary and uſeful, but is abſolutely neceſſary.

In an ingenious publication, intitled, *A Practical Treatiſe on Chimneys*, there are the following remarks relating to the propereſt method of admitting air into a room, and of expelling the contaminated air. The author, directing to make a vent-hole near the top of the room, in order to expel the heated and contaminated air, "this," ſays he "might be done by means of a ſmall tube opening into the room, either in or near the ceiling; which might either be carried to the top of the building, or be made to communicate with the external air by a ſmall perforation through the wall at the roof of the room; by means of either of which, a proper circulation would be eſtabliſhed, and the foul air be carried off.

"For the fire would no ſooner have warmed any particles of air within the room, than theſe would be greatly expanded, and riſe immediately upwards, ſo as to fill the higher parts of the room with rarefied air; and as other particles would be ſucceſſively heated and rarefied in their turn, by their expanſive force they would preſs upon the ſides of the apartment in every place, ſo as to force the lighteſt particles through the opening left for that purpoſe in the top of the room; by which means the fouleſt air would be gradually drawn off, without deſcending again into the lower regions to the annoyance of the company."

But in order to admit freſh air into the room, "Let," ſays he, "another opening be made in the ceiling of the room, having a communication with a ſmall pipe that ſhould lead from thence either to the outſide of the wall, or to any other part of the building that might be judged more convenient, where it ſhould be bent, and conducted downwards, till it reached the ground; where it ſhould be left open, to communicate with the external air.—In this ſituation the cool external air would be forced in at the lower opening of the tube, and made to aſcend into the apartment in proportion to the quantity that eſcaped towards the higher regions by means of the ventilator. And as that weighty air would no ſooner enter the room, than it would tend towards the floor by its own natural gravity, it would gradually mix with the heated air in its deſcent—become, in ſome meaſure, warmed by that means, and equally diſperſed through the room, ſo as ſlowly and imperceptibly to reach the candles and the company in the room, and ſupply them with a ſufficient quantity of freſh and wholeſome air, without the inconveniences to which the company are ſubjected by the uſual way of admitting freſh air (A). For if it enters near the floor of the apartment, it is hurried along in a rapid undivided ſtream towards the fire-place, and ſtriking upon the legs and inferior parts of the body, affects them with a ſtrong ſenſation of cold. To overcome the effects of this, large fires muſt be kept; by which other parts of the body are warmed to an extraordinary degree, which is productive of moſt of thoſe diſorders that are pernicious to the young, and often prove fatal to the old, during the winter-ſeaſon, in theſe cold regions.

"Thus might our apartments be kept conſtantly, and moderately, and equally warm, at a moderate expence, without endangering our health on the one hand, by reſpiring a confined, ſtagnant, and putrid air, or, on the other hand, by ſubjecting ourſelves to ſuch danger of catching colds, conſumptions, and rheumatic complaints, by being expoſed to ſuch exceedingly unequal

(A) Such readers as have been little accuſtomed to ſpeculations of this ſort, will be at a loſs to comprehend in what manner two holes, both of them in the roof of the room, and communicating with the air, without any valve, or other contrivance, for opening or cloſing of themſelves, ſhould yet anſwer the two very oppoſite purpoſes; one, of conſtantly bringing cool air into the room without emitting any warm air—and the other, of as conſtantly emitting warm and admitting no cool air. They will pleaſe to advert, that the one of theſe tubes communicates with the atmoſphere at the bottom of the houſe, and the other towards the top: the opening of the one is beneath the level of the room, that of the other above it. Now, as the air is more denſe at the ſurface of the ground than at any height above it, the warm rarefying air will naturally iſſue at that opening where it meets with leaſt reſiſtance, which muſt invariably be through that which opens to the external air at the greateſt height; and as the cool air will naturally be preſſed into the room by that opening where the air is moſt weighty, this muſt invariably be by that which is neareſt the ſurface of the earth.

Air ‖ Air-gun.

equal degrees of heat and cold, as are unavoidable where our apartments are ſo open as to admit a ready paſſage to the external air during the winter-ſeaſon.

"The reader will eaſily perceive, that all that has been here ſaid has a reference only to thoſe apartments in cold climates, and rigorous weather, where fire to warm them becomes neceſſary. In warmer regions, or during the ſummer-ſeaſon, there can be no objection to the wheel-ventilator in the window.—It is a ſimple contrivance, and a ſafe and effectual mean of preſerving the air in our apartments ſweet and wholeſome at that ſeaſon."

It is a vulgar error among many people, to believe that fire purifies the contaminated air, by deſtroying the noxious particles mixed with it; and for this reaſon they think, that the fire kept in a room where the air is tainted, purifies the room, by rendering the air in it again fit for reſpiration. Indeed, a fire kept in a room or apartment where the air is tainted, as is the caſe with hoſpitals, goals, and the like, does certainly purify the apartment, and the practice is very uſeful; but this effect is only becauſe the fire promotes the circulation of the air, and dries the dampneſs of rooms, furniture, &c.: ſo that it is not the infected air that is purified, but is new, freſh, and wholeſome air, that by the action of the fire has taken the place of the infected air; which infected air, being rarefied by the heat, has been expelled from the apartment. Fire and combuſtion in general is ſo far from purifying contaminated air, that it actually contaminates a prodigious quantity of it in a ſhort time; ſo that not only a common fire, but even a lighted candle, when kept in a well-cloſed room, wherein the external air has not a free acceſs, inſtead of purifying, renders the air of that room noxious.

Inſtrument for aſcertaining the Purity or Wholeſomeneſs of reſpirable Air. See Eudiometer.

AIR Balloons, a general name given to bags of any light ſubſtance filled with inflammable air, or other permanently elaſtic fluid, whoſe ſpecific gravity is conſiderably leſs than that of common atmoſpheric air. The conſequence of their heing filled in this manner is, that if they are of any conſiderable magnitude, they aſcend in the air to an amazing height; and will not only aſcend in this manner by themſelves, but carry up along with them great weights, and continue to riſe till they attain an height in which the circumambient air is of the ſame ſpecific gravity with themſelves. In this ſituation they will either float or be driven in the direction of the wind or current of air in which they are expoſed, remaining in theſe elevated regions till the fluid eſcapes by the burſting of the bags from the ſuperior elaſticity of the fluid, or by its gradual evaporation through the pores of the envelope. The hiſtory, principles, &c. of thoſe machines are detailed under the article Aerostation.

Air-Bladder, in fiſhes. See Comparative Anatomy, chap. iii. and Ichthyology.

Plate VII.

Air-Gun, a pneumatic machine for exploding bullets, &c. with great violence.

The common air-gun is made of braſs, and has two barrels; the inſide barrel A, fig. 8. which is of a ſmall bore, from whence the bullets are exploded; and a large barrel ECDR on the outſide of it. There is a ſyringe SMNP fixed in the ſtock of the gun, by which the air is injected into the cavity between the two barrels through the valve EP. The ball K is put down into its place in the ſmall barrel, with the rammer, as in any other gun. At SL is another valve, which, being opened by the trigger O, permits the air to come behind the bullet, ſo as to drive it out with great force. If this valve be opened and ſhut ſuddenly, one charge of condenſed air may be ſufficient for ſeveral diſcharges of bullets; but if the whole air be diſcharged on one ſingle bullet, it will drive it out with a great force. This diſcharge is effected by means of a lock, fig. 9. placed here as uſual in other guns; for the trigger being pulled, the cock will go down and drive the lever O, fig. 8. which will open the valve, and let in the air upon the bullet K.

Air-guns of late years have received very great improvements in their conſtruction. Fig. 10. is a repreſentation of one made by the late Mr B. Martin of London, and now by ſeveral of the mathematical inſtrument and gun makers of the metropolis. For ſimplicity and perfection it exceeds any other heretofore contrived. A is the gun-barrel, with the lock, ſtock, ram-rod, and of the ſize and weight of a common fowling-piece. Under the lock, at *b*, is a round ſteel tube, having a ſmall moveable pin in the inſide, which is puſhed out when the trigger *a* is pulled, by the ſpring-work within the lock; to this tube *b*, a hollow copper-ball *c* ſcrews, perfectly air-tight. This copper ball is fully charged with condenſed air by the ſyringe B (fig. 7.) previous to its being applied to the tube *b* of fig. 10. It is then evident, that if a bullet be rammed down in the barrel, the copper ball ſcrewed faſt at *b*, and the trigger *a* be pulled, that the pin in *b* will, by the action of the ſpring-work within the lock, forcibly ſtrike out into the copper ball; and thereby puſhing in ſuddenly a *valve* within the copper ball, let out a portion of the condenſed air; which air will ruſh up thro' the aperture of the lock, and forcibly act againſt the bullet, driving it to the diſtance of 60 or 70 yards or further. If the air is ſtrongly condenſed at every diſcharge, only a portion of the air eſcapes from the ball; therefore, by re-cocking the piece, another diſcharge may be made; and this repeated to the amount of 15 or 16 times. An additional barrel is ſometimes made, and applied for the diſcharge of ſhot, inſtead of the one above deſcribed.

The air in the copper ball is condenſed by means of the ſyringe B (fig. 7.), in the following manner: The ball *c* is ſcrewed quite cloſe on the top of the ſyringe at *b*, at the end of the ſteel pointed rod: *a* is a ſtout ring through which paſſes the rod *k*: upon this rod the feet uſe to be formerly ſet; then the hands are to be applied to the two handles *i i*, fixed on the ſide of the barrel of the ſyringe. Now by moving the barrel B ſteadily up and down on the rod *a*, the ball *c* will become charged with condenſed air; and it may be eaſily known when the ball is as full as poſſible, by the irreſiſtible action that the air makes againſt the piſton when you are working the ſyringe. At the end of the rod *k* is uſually a four-ſquare hole, which with the rod ſerves as a key to faſten the ball *c* faſt on the ſcrew *b* of the gun and ſyringe cloſe to the orifice in the ball *c*. In the inſide is fixed a valve and ſpring, which gives way for the admiſſion of air; but upon its emiſſion comes cloſe up to the orifice, ſhutting up the internal air.

Air-gun.

air. The piſton-rod works air-tight, by a collar of leather on it, in the barrel B; it is therefore plain, when the barrel is drawn up, the air will ruſh in at the hole *h*. When the barrel is puſhed down, the air therein contained will have no other way to paſs from the preſſure of the piſton but into the ball *c* at top. The barrel being drawn up, the operation is repeated, until the condenſation is ſo ſtrong as to reſiſt the action of the piſton.

Sometimes the ſyringe is applied to the end of the barrel C (ſee fig. 11.); the lock and trigger ſhut up in a braſs caſe *d*; and the trigger pulled, or diſcharge made, by pulling the chain *b*. In this contrivance there is a round chamber for the condenſed air at the end of the ſyringe at *e*, and it has a valve acting in a ſimilar manner to that of the copper ball. When this inſtrument is not in uſe, the braſs caſe *d* is made to ſlide off, and the inſtrument then becomes a walking-ſtick; from which circumſtance, and the barrel being made of cane, braſs, &c. it has received the appellation of the *Air-cane*. The head of the cane unſcrews and takes off at *a*, where the extremity of the piſton-rod in the barrel is ſhown: an iron rod is placed in a ring at the end of this, and the air condenſed in the barrel in a ſimilar manner to that of the gun as above; but its force of action is not near ſo ſtrong and permanent as that of the latter.

The *Magazine Air-gun* was invented by that ingenious artiſt L. Colbe. By this contrivance ten bullets are ſo lodged in a cavity, near the place of diſcharge, that they may be drawn into the ſhooting-barrel, and ſucceſſively diſcharged ſo faſt as to be nearly of the ſame uſe as ſo many different guns.

Fig. 12. repreſents the preſent form of this machine, where part of the ſtock is cut off, to the end of the injecting ſyringe. It has its valve opening into the cavity between the barrels, as before. K K is the ſmall ſhooting-barrel, which receives the bullets from the magazine E D, which is of a ſerpentine form, and cloſed at the end D when the bullets are lodged in it. The circular part *a b c*, is the key of a cock, having a cylindric hole through it, *i k*, which is equal to the bore of the ſame barrel, and makes a part of it in the preſent ſituation. When the lock is taken off, the ſeveral parts Q, R, T, W. &c. come into view, by which means the diſcharge is made by puſhing up the pin P*p*, which raiſes and opens a valve V, to let in the air againſt the bullet I, from the cavity F F; which valve is immediately ſhut down again by means of a long ſpring of braſs N N. This valve V being a conical piece of braſs, ground very true in the part which receives it, will of itſelf be ſufficient to confine the air.

To make a diſcharge, you will pull the trigger ZZ, which throws up the ſeer *y a*, and diſengages it from the notch *a*, upon which the ſtrong ſpring WW moves the tumbler T, to which the cock is fixed. This, by its end *u*, bears down the end *v* of the tumbling lever R, which, by the other end *m*, raiſes at the ſame time the flat end of the horizontal lever Q; and by this means, of courſe, the pin P *p*, which ſtands upon it, is puſhed up, and thus opens the valve V, and diſcharges the bullet. This is all evident from a bare view of the figure.

To bring another bullet to ſucceed that marked I, inſtantaneouſly, turn the cylindric cavity of the key of the cock, which before made part of the barrel K K, into the ſituation *i k*, ſo that the part *i* may be at K; and hold the gun upon your ſhoulder, with the barrel downwards and the magazine upwards, by which means that bullet next the cock will fall into it out of the magazine, but go no farther into this cylindric cavity than the two little ſprings *s s*, which detain it. The two circles repreſent the cock-barrel, wherein the key abovementioned turns upon an axis not repreſented here, but viſible in fig. 13. This axis is a ſquare piece of ſteel, on which comes the ſquare hole of the hammer H, fig. 14.; by which the cylindric cavity mentioned is opened to the magazine. Then opening the hammer, as in that figure, the bullet is brought into its proper place near the diſcharge-valve, and the cylindric cavity of the key of the cock again makes part of the inward barrel K K.

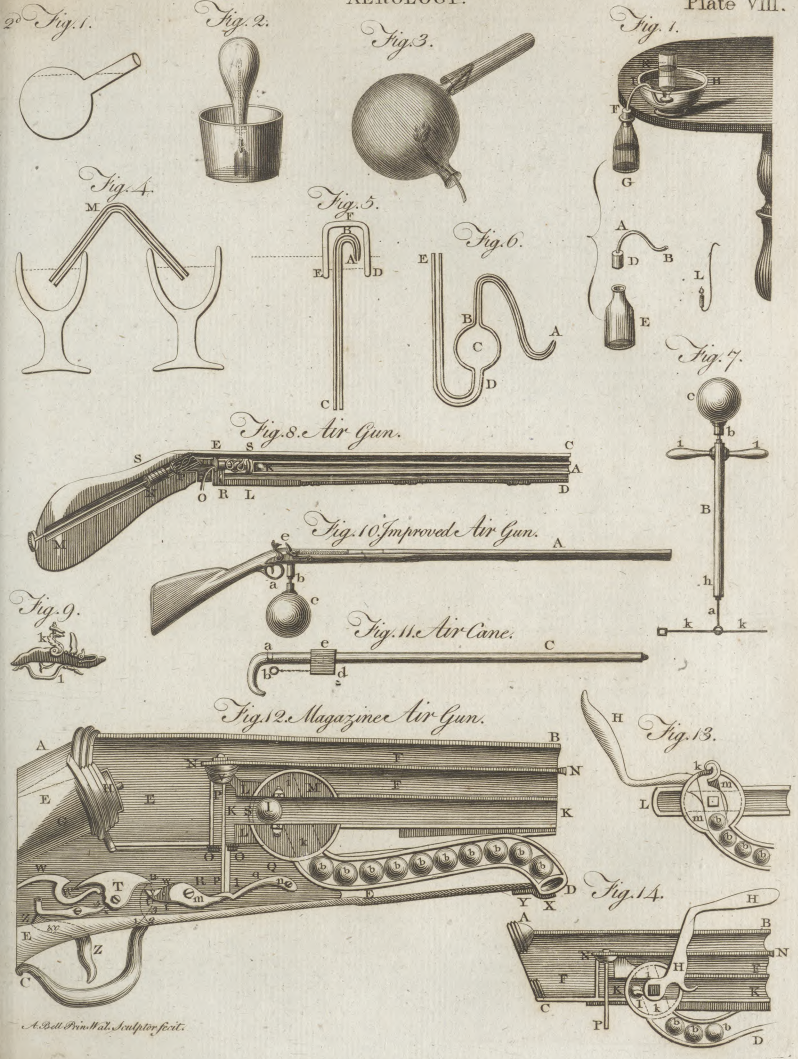
It evidently appears how expeditious a method this is of charging and diſcharging a gun; and were the force of condenſed air equal to that of gun-powder, ſuch an air-gun would anſwer the end of ſeveral guns.

In the air-gun, and all other caſes where the air is required to be condenſed to a very great degree, it will be requiſite to have the ſyringe of a ſmall bore, viz. not exceeding half an inch in diameter; becauſe the preſſure againſt every ſquare inch is about 15 pounds, and therefore againſt every circular inch about 12 pounds. If therefore the ſyringe be one inch in diameter, when one atmoſphere is injected, there will be a reſiſtance of 12 pounds againſt the piſton; and when 10 are injected, there will be a force of 120 pounds to be overcome; whereas 10 atmoſpheres act againſt the circular half-inch piſton (whoſe area is only one-fourth part ſo big) with only a force equal to 30 pounds; or 40 atmoſpheres may be injected with ſuch a ſyringe, as well as 10 with the other. In ſhort, the facility of working will be inverſely as the ſquares of the diameter of the ſyringe.

Air-Jacket, a ſort of jacket made of leather, in which are ſeveral bags, or bladders, compoſed of the ſame materials, communicating with each other. Theſe are filled with air through a leather tube, having a braſs ſtop-cock accurately ground at the extremity, by which means the air blown in through the tube is confined in the bladders. The jacket muſt be wet, before the air be blown into the bags, as otherwiſe it will immediately eſcape through the pores of the leather. By the help of theſe bladders, which are placed near the breaſt, the perſon is ſupported in the water, without making the efforts uſed in ſwimming.

Air-gun ‖ Air-pipes.

Air-Pipes, an invention for drawing foul air out of ſhips, or any other cloſe places, by means of fire. Theſe pipes were firſt found out by one Mr Sutton, a brewer in London; and from him have got the name of *Sutton's Air-pipes*. The principle on which their operation depends is known to every body, being indeed no other than that air is neceſſary for the ſupport of fire; and, if it has not acceſs from the places moſt adjacent, will not fail to come from thoſe that are more remote. Thus, in a common furnace, the air enters through the aſh-hole; but if this is cloſed up, and a hole made in the ſide of the furnace, the air will ruſh in with great violence through that hole. If a tube of any length whatever is inſerted in this hole, the air will ruſh through the tube into the fire, and of con-



A. Bell Prin. Wal. Sculptor fecit.

Air-pipes. consequence there will be a continued circulation of air in that place where the extremity of the tube is laid. Mr Sutton's contrivance then, as communicated to the Royal Society by Doctor Mead, amounts to no more than this.—" As, in every ſhip of any bulk, there is already provided a copper or boiling-place proportionable to the ſize of the veſſel; it is propoſed to clear the bad air, by means of the fire already uſed under the ſaid coppers or boiling-places for the neceſſary uſes of the ſhip.

" It is well known, that, under every ſuch copper or boiler, there are placed two holes, ſeparated by a grate; the firſt of which is for the fire, and the other for the aſhes falling from the ſame; and that there is alſo a flue from the fire-place upward, by which the ſmoke of the fire is diſcharged at ſome convenient place of the ſhip.

" It is alſo well known, that the fire once lighted in theſe fire-places, is only preſerved by the conſtant draught of air through the forementioned two holes and flue; and that if the ſaid two holes are cloſely ſtopped up, the fire, though burning ever ſo briſkly before, is immediately put out.

" But if, after ſhutting up the abovementioned holes, another hole be opened, communicating with any other room or airy place, and with the fire; it is clear, the ſaid fire muſt again be raiſed and burn as before, there being a like draught of air through the ſame as there was before the ſtopping up of the firſt holes; this caſe differing only from the former in this, that the air feeding the fire will now be ſupplied from another place.

" It is therefore propoſed, that, in order to clear the holds of ſhips of the bad air therein contained, the two holes abovementioned, the fire-place and aſh-place, be both cloſed up with ſubſtantial and tight iron-doors; and that a copper or leaden pipe, of ſufficient ſize, be laid from the hold into the aſh-place, for the draught of air to come in that way to feed the fire. And thus it ſeems plain, from what has been already ſaid, that there will be, from the hold, a conſtant diſcharge of the air therein contained; and conſequently, that that air, ſo diſcharged, muſt be as conſtantly ſupplied by freſh air down the hatches or ſuch other communications as are opened into the hold; whereby the ſame muſt be continually freſhened, and its air rendered more wholeſome and fit for reſpiration.

" And if into this principal pipe ſo laid into the hold, other pipes are let in, communicating reſpectively either with the well or lower decks; it muſt follow, that part of the air, conſumed in feeding the fire, muſt be reſpectively drawn out of all ſuch places to which the communication ſhall be ſo made."

This account is ſo plain, that no doubt can remain concerning the efficacy of the contrivance: it is evident, that, by means of pipes of this kind, a conſtant circulation of freſh air would be occaſioned thro' thoſe places where it would otherwiſe be moſt apt to ſtagnate and putrefy. Several other contrivances have been uſed for the ſame purpoſe; and Doctor Hales's ventilators, by ſome unaccountable prejudice, have been reckoned ſuperior in efficacy and even ſimplicity to Mr Sutton's machine, which at its firſt invention met with great oppoſition *, and even when introduced by Dr Mead, who uſed all his intereſt for that purpoſe, was ſhamefully neglected.

* See *Sutton*.

A machine capable of anſwering the ſame purpoſe was invented by Mr Deſaguliers, which he called the *ſhip's lungs*. It conſiſted of a cylindrical box ſet up on its edge, and fixed to a wooden pedeſtal. From the upper edge of the box iſſued a ſquare trunk open at the end, and communicating with the cavity of the box. Within this box was placed a cylindrical wheel turning on an axis. It was divided into 12 parts, by means of partitions placed like the radii of a circle. Theſe partitions did not extend quite to the centre, but left an open ſpace of about 18 inches diameter in the middle; towards the circumference, they extended as far as poſſible without interfering with the caſe, ſo that the wheel might always be allowed to turn freely.—Things being thus circumſtanced, it is plain, that if the wheel was turned towards that ſide of the box on which the trunk was, every diviſion would puſh the air before it, and drive it out through the trunk, at the ſame time that freſh air would come in through the open ſpace at the centre, to ſupply that which was thrown out thro' the trunk. By turning the wheel ſwiftly, a ſtrong blaſt of air would be continually forced out thro' the ſquare trunk, on the ſame principles on which a common fanner winnows corn. If the wheel is turned the oppoſite way, a draught of air may be produced from the trunk to the centre. If this machine, then, is placed in room where a circulation of air is wanted, and the trunk made to paſs through one of the walls; by turning the wheel ſwiftly round, the air will be forced with great velocity out of that room, at the ſame time that freſh air will enter through any chinks by which it can have acceſs to ſupply that which has been forced out.

It is evident, that the circulation which is promoted by this machine, is entirely of the ſame kind with that produced by Mr Sutton's; the turning of the wheel in Mr Deſagulier's machine being equivalent to the rarefaction of the air by fire in Mr Sutton's: but that the latter is vaſtly ſuperior, as acting of itſelf, and without intermiſſion, requires no arguments to prove. Mr Sutton's machine has yet another conveniency, of which no other contrivance for the ſame purpoſe can boaſt; namely, that it not only draws out putrid air, but deſtroys it by cauſing it paſs through fire; and experience has abundantly ſhown, that though putrid air is thrown into a great quantity of freſh air, it is ſo far from loſing its pernicious properties, that it often produces noxious diſeaſes. We do not ſay, indeed, that putrid air becomes ſalutary by this means; but it is undoubtedly rendered leſs noxious than before; tho' whether it is equally innocent with the ſmoke of a fire fed in the common way, we cannot pretend to determine.

Beſides this machine by Mr Deſaguliers, the ventilators of Dr Hales, already mentioned, and thoſe called *wind-ſails*, are likewiſe uſed for the ſame purpoſe. The former of which is an improvement of the Heſſian-bellows *: the other is a contrivance for throwing freſh air into thoſe places where putrid air is apt to lodge; but this has the laſt-mentioned inconvenience in a much greater degree than any of the others, as the blaſt of freſh air throws out that which was rendered putrid by ſtagnation, in ſuch a manner as to contaminate all around it. See Wind-*Sails*.

* See *Ventilator*.

Air-Trunk, is alfo a contrivance by Doctor Hales to prevent the ftagnation of putrid effluvia in jails, and other places where a great number of people are crowded together in a fmall fpace. It confifts only of a long fquare trunk open at both ends; one of which is inferted into the ceiling of the room, the air of which is required to be kept pure; and the other extends a good way beyond the roof. Through this trunk a continued circulation is carried on: and the reafon is, that the putrid effluvia which do fo much mifchief when collected, being much lighter than the pure atmofphere, arife to the top of the room; and, if they there find a vent, will continually go out through it. Thefe effluvia arife in very confiderable quantity, being calculated by the late Dr Keil at no lefs than 39 ounces from one man in 24 hours.

Thefe trunks were firft made trial of by Mr Yeoman, over the Houfe of Commons, where they were nine inches wide within; and over the Court of King's-bench in Weftminfter-hall, where they were fix inches wide. They are fometimes made wider, and fometimes narrower: but the wider they are the longer they ought to be, more effectually to promote the afcent of the vapour. The reafon why vapours of this kind afcend more fwiftly through a long trunk than a fhort one, is, that the preffure of fluids is always according to their different depth, without regard to the diameter of their bafis, or of the veffel which contains them; and, upon this principle, a gallon of water may be made to fplit a ftrong cafk. See Hydrostatics. When the column of putrid effluvia is long and narrow, the difference between the column of atmofphere preffing on the upper end of the trunk, and that which preffes on the lower end, is much greater than if the column of putrid effluvia was fhort and wide; and confequently the afcent is much fwifter.—One pan of a fingle pair of fcales, which was two inches in diameter, being held within one of thefe trunks over the Houfe of Commons, the force of the afcending air made it rife fo as to require four grains to reftore the equilibrium, and this when there was no perfon in the houfe; but when it was full, no lefs than 12 grains were requifite to reftore the equilibrium; which clearly fhows that thefe trunks muft be of real and very great efficacy.

Air-Pump, a machine by which the air contained in a proper veffel may be exhaufted or drawn out. See the article Pneumatics.

Air-Sacs, in birds. See Comparative Anatomy, chap. ii.

Air-Shafts, among miners, denote holes or fhafts let down from the open air to meet the adits and furnifh frefh air. The damps, want, and impurity of air which occur, when adits are wrought 30 or 40 fathoms long, make it neceffary to let down air-fhafts, in order to give the air liberty to play through the whole work, and thus difcharge bad vapours, and furnifh good air for refpiration: the expence of which fhafts, in regard of their vaft depths, hardnefs of the rock, drawing of water, &c. fometimes equals, nay exceeds, the ordinary charge of the whole adit.

Sir Robert Murray defcribes a method, ufed in the coal-mines at Liege, of working mines without air-fhafts.

When the miners at Mendip have funk a groove, they will not be at the charge of an air-fhaft till they come at ore; and for the fupply of air have boxes of elm exactly clofed, of about fix inches in the clear, by which they carry it down about twenty fathoms. They cut a trench at a little diftance from the top of the groove, covering it with turf and rods difpofed to receive the pipe, which they contrive to come in fideways to their groove, four feet from the top; which carries down the air to a great depth. When they come at ore, and need an air-fhaft, they fink it four or five fathoms diftant, according to the convenience of the breadth, and of the fame fafhion with the groove, to draw as well ore as air.

Air-Threads, in natural hiftory, a name given to the long filaments, fo frequently feen in autumn floating about in the air.

Thefe threads are the work of fpiders, efpecially of that fpecies called the long-legged field-fpider; which, having mounted to the fummit of a bufh or tree, darts from its tail feveral of thefe threads, till one is produced capable of fupporting the creature in the air: on this it mounts in queft of prey, and frequently rifes to a very confiderable height. See Aranea.

Air-Veffels, are fpiral ducts in the leaves, &c. of plants, fuppofed to be analogous to the lungs of animals, in fupplying the different parts of a plant with air. See the article Plants.

Air, in mythology, was adored by the Heathens under the names of Jupiter and Juno; the former reprefenting the fuperior and finer part of the atmofphere, and the latter the inferior and groffer part. The augurs alfo drew prefages from the clouds, thunder, lightning, &c.

Air, in painting, &c. denotes the manner and very life of action; or it is that which expreffes the difpofition of the agent.—It is fometimes alfo ufed in a fynonymous fenfe with gefture or attitude.

Air, in mufic, is taken in different fenfes. It is fometimes contrafted with harmony; and, in this fenfe, it is fynonymous with melody in general.—Its proper meaning is, A tune, which is fet to words, or to fhort pieces of poetry that are called *fongs*.

In operas, we give the name of *air* to fuch pieces of mufic as are formed with meafures and cadences, to diftinguifh it from the recitative; and, in general, every piece of mufic is called an *air*, which is formed for the voice, or even for inftruments, and adapted to ftanzas, whether it forms a whole in itfelf, or whether it can be detached from any whole of which it forms a part, and be executed alone.

If the fubject admits of harmony, and is fet in parts, the *air* is, according to their number, denominated a *duett*, a *trio*, a *quartetto*, &c. We need not follow Rouffeau, and the other philologifts, in their endeavours to inveftigate the etymon of the word *air*. Its derivation, though found and afcertained, would contribute little to illuftrate its meaning in that remote fenfe, to which, through a long continuance of time, and the various viciffitudes of language, it has now paffed. The curious may confult the fame article in the *Dictionnaire de Mufique* by M. Rouffeau.

In modern mufic, there are feveral different kinds of *airs*, each of which agrees to a certain kind of dancing, and from thefe dances the airs themfelves take their fpecific names.

The *airs* of our operas, are, if we may be permitted the

the expression, the canvass or substratum upon which are painted all the pictures of imitative music; melody is the design, and harmony the colouring; every picturesque object selected from the most beautiful parts of nature, every reflected sentiment of the human heart, are the models which the artist imitates; whatever gains attention, whatever interests the soul, whatever charms the ear, or causes emotion in the heart, these are the objects of his imitation. See IMITATION. An air which delights the ear, and discovers the learning of the composer; an air invented by genius, and composed with taste; is the noblest effort of music: it is this which explores the compass, and displays the delicacy, of a beautiful voice; it is in this where the charms of a well-conducted symphony shine; it is by this, that the passions, excited and inflamed by nice gradations, reach and agitate the soul through the avenues of external sense. After hearing a beautiful *air*, the mind is acquiescent and serene: the ear is satisfied, not disgusted: it remains impressed on the fancy, it becomes a part of our essence, we carry it with us, we are able to repeat it at pleasure: without the ability acquired by habit to breathe a single note of it, we execute it in our imagination in the same manner as we heard it upon the theatre: one sees the scene, the actor, the theatre; one hears the accompaniments and the applauses. The real enthusiast in music never forgets the beautiful airs which he has heard; when he chooses, he causes the opera to recommence.

The words to which *airs* are adapted, are not always rehearsed in regular succession, nor spoken in the same manner with those of the recitative; and though, for ordinary, they are very short, yet they are interrupted, repeated, transposed, at the pleasure of the artist. They do not constitute a narrative, which once told is over: they either delineate a picture, which it is necessary to contemplate in different points of view; or inspire a sentiment in which the heart acquiesces with pleasure, and from which it is neither able nor willing to be disengaged; and the different phrases of the *air*, are nothing else but different manners of beholding the same image. This is the reason why the subject of an *air* should be one. It is by these repetitions properly placed, it is by these redoubled efforts, that an impression, which at first was not able to move you, at length shakes your soul, agitates you, transports you out of yourself: and it is likewise upon the same principle, that the runnings, as they are called, or those long, mazy, and inarticulated inflections of the voice, which, in pathetic *airs*, frequently seem, though they are not always so, improperly placed; whilst the heart is affected with a sentiment exquisitely moving, it often expresses its emotions by inarticulate sounds, more strongly and sensibly than it could do by words themselves.

The form of *airs* is of two kinds. The small airs are often composed of two strains, which ought each of them to be sung twice; but the important airs in operas are frequently in the form of rondeaus.

AIR, or *Ayr*, in geography, a town of Scotland, capital of an extensive county of the same name. It stands on the river Air, and was formerly a place of good trade, and seat of fisheries; all of which have vanished, and the people now live by one another. Air appears, from history and other documents, to have been a considerable place at the time of the Norman conquest. The vouchers of its antiquity are corroborated by an elegant building, called the *Cross*, which hath escaped the destructive rage of the last and preceding century. The date on this fragment of antiquity is 1055, consequently it hath stood in its place above 730 years; and it is to be wished, that the majority of the inhabitants may unite in preserving it from being destroyed by persons who have expressed a strong desire to that purpose. In 1557, the tax levied upon Air was L. 236 Scots; upon Glasgow only L. 202. In 1771, Air was assessed at 15 s. Sterl. and Glasgow at L. 18, 10s. In 1751, the pickled herrings exported from Air were 6624 barrels; since the year 1777, none. These revolutions appear the more extraordinary, when we consider the very advantageous situation of Air both by land and water; the fertility of the country; the riches of the sea; its contiguity to the western fisheries on one side, and to Glasgow on the other; the large returns for cattle, grain, and coal; the ample revenues of the town; and particularly the conveniency of its harbour for fishing-vessels of every construction.—About a mile north from the town there is a lazar-house, commonly called *The King's Chapel*, which King Robert de Bruce set apart for the maintenance of lepers.

AIRA, in botany: A genus of the triandria digynia class; and in the natural method ranking under the 4th order, *Gramina*. The characters are: The *calyx* is a two-flowered double-valved glume: The *corolla* is two-valved, and no rudiment of a flower between the florets: The *stamina* consist of three capillary filaments the length of the flower; the antheræ are oblong, and forked at both ends: The *pistillum* is an egg-shaped germen; the styli are two, bristly, and expanding; the stigmata are pubescent: There is no *pericarpium*; the including corolla grows to the seed: The *seed* is egg-shaped and covered. There are 14 species of the aira, nine of which are natives of Britain. The English name is *Hair-grass*. See the general article GRASS.

AIRANI, in church-history, an obscure sect of Arians, in the fourth century, who denied the consubstantiality of the Holy Ghost with the Father and the Son. They are otherwise called *Airanistæ*; and are said to have taken their name from one *Airas*, who distinguished himself at the head of this party, in the reigns of Valentinian and Gratian.

AIRE, a town of France, in Proper Gascony, of which it is the capital, with a bishop's see. It is seated on the river Adour, on the declivity of a mountain. E. Long. 0. 3. N. Lat. 43. 47.

AIRE, a strong town in the Netherlands, in the county of Artois, with a castle. It was taken by the French in 1710, and was confirmed to them by the treaty of Utrecht. It is seated on the river Lis, 22 miles south of Dunkirk, and communicates with St Omer's by a canal cut from the river Aa. E. Long. 2. 31. N. Lat. 50. 38.

AIRING, a term peculiarly used for the exercising horses in the open air. It purifies the blood; purges the body from gross humours; and, as the jockies express it, teaches the horse how to make his wind rake equally, and keep time with the other motions of his body. It also sharpens the stomach, and keeps the creature hungry; which is a thing of great consequence, as hunters and racers are very apt to have their stomach fall off, either from want of exercise, or from the too violent

exer-

exercife which they are often expofed to. If the horfe be over fat, it is beft to air him before fun-rife and after fun-fetting; and in general, it is allowed by all, that nothing is more beneficial to thofe creatures than early and late airings. Some of our modern managers, however, difpute this: they fay, that the cold of thefe times is too great for the creature; and that if, in particular, he is fubject to cattarrhs, rheums, or the like complaints, the dews and cold fogs, in thefe early and late airings, will be apt to increafe all thofe diforders. Nature, we fee, alfo points out the fun-beams as of great ufe to thefe animals; thofe which are kept hardy and lie out all night, always running to thofe places where the funfhine comes, as foon as it appears in a morning. This fhould feem to recommend thofe airings that are to be made before fun-fet, and a little time after fun-rife. As to the caution, fo earneftly inculcated by Markham, of ufing thefe early and late airings for fat horfes, it is found unneceffary by many: for they fay, that the fame effect may be produced by airings at warmer times, provided only that they are made longer; and that, in general, it is from long airings that we are to expect to bring a horfe to a perfect wind and found courage.

AIRS, in the manege, are the artificial motions of taught horfes; as the demivolt, curvet, capriole, &c.

AIRY, or AERY, among fportfmen, a term expreffing the neft of a hawk or eagle.

Airy Triplicity, among aftrologers, denotes the three figns, gemini, libra, and aquarius.

AISNE, a river of France, which rifes in Champaign, and runs W. by Soifons in the Ifle of France, falling into the river Oife, a little above Campeigne.

AITOCZU, a confiderable river of Leffer Afia, which, arifing in the mountain Taurus, falls into the fouth part of the Euxine fea.

AJUGA, BUGLE: A genus of the gymnofpermia order, belonging to the didynamia clafs of plants; and in the natural method ranking under the 42d order, *Afperifoliæ*. The characters are: The *calyx* is a fhort perianthium, monophyllous and perfiftent: The *corolla* is monopetalous and grinning: The *ftamina* confift of four erect fubulated filaments; the antheræ are dimidiated: The *piftillum* has a four-cleft germen, a filiform ftylus, and two flender ftigmata. There is no *pericarpium*; the calyx converging, and containing the feeds in its bofom: The *feeds* are four, and oblong. The

Species enumerated by Linnæus are, 1. The orientalis, with inverted flowers, which is a native of the eaft. 2. The genevenfis, with woolly leaves and hairy cups, is a native of Swifferland and of the fouthern parts of Europe. 3. The pyramidalis, or mountain-bugle, with a fquare pyramidal fpike and blue flowers, is a native of Sweden, Germany, Swifferland, and the hilly parts of Britain. Sheep and goats eat it; cows are not fond of it; horfes and fwine refufe it. 4. The reptans, common or pafture bugle, with creeping fuckers, and blue, red, or white bloffoms, in long leafy fpikes, is a native of the fouthern parts of Europe, and is met with in woods and moift places in many parts of Britain. The roots are aftringent, and ftrike a black colour with vitriol of iron.

Culture. The firft fpecies is propagated by fowing the feeds foon after they are ripe, in a pot filled with loamy earth, and placed in a fhady fituation till autumn; when it muft be removed under a frame, and protected from the frofts. In the fpring, after the plants are come up, let them be tranflated each into a feparate pot, and in fummer placed under a fhady fituation. The other forts are eafily propogated by their fide-fhoots, and fucceed beft in a moift fhady fituation.

AIUS LOCUTIUS, the name of a deity to whom the Romans erected an altar.—The words are Latin, and fignify "a fpeaking voice."—The following accident gave occafion to the Romans erecting an altar to the Aius Locutius. One M. Seditius, a plebian, acquainted the tribunes, that, in walking the ftreets by night, he had heard a voice over the temple of Vefta, giving the Romans notice that the Gauls were coming againft them. This intimation was however neglected; but after the truth was confirmed by the event, Camillus acknowledged this voice to be a new deity, and erected an altar to it under the name of the *Aius Locutius*.

AJUTAGE, or ADJUTAGE, a kind of tube fitted to the mouth of the veffel through which the water of a fountain is to be played. To the different form and ftructure of ajutages, is owing to the great variety of fountains. See FOUNTAIN and HYDROSTATICS.

AIX, a fmall, but ancient town in the duchy of Savoy, with the title of a marquifate. It is feated on the lake Bourget, at the foot of a mountain, between Chamberry, Annecy, and Rumilly. There is here a triumphal arch of the ancient Romans, but it is almoft entirely ruined. The mineral waters bring a great number of ftrangers to this place. The place was originally called *Aquæ Gratianæ*, from the hot baths built there by the Emperor Gratian. E. Long. 7. 10. N. Lat. 45. 40.

AIX, an ancient city, the capital of Provence, in France. It is an archbifhopric; and has a parliament, a court of aids, a chamber of accounts, a fenefchal's jurifdiction, a generality, and an univerfity. It has that air of filence and gloom fo commonly characteriftic of places deftitute of commerce or induftry: It is, however, a well-built city; and moft like Paris of any place in the kingdom, as well for the largenefs of the buildings, as in refpect of the politenefs of the inhabitants. It is embellifhed with abundance of fine fountains, and feveral beautiful fquares. The preachers fquare is on the fide of a hill; it is about 160 yards in length, and is furrounded with trees, and houfes built with ftone three ftories high. The town-hall is at one end of the city, and is diftributed into feveral fine apartments: the two loweft are taken up by the board of accounts, and by the fenefchal; that above is defigned for the feffions of parliament. The hall of audience is adorned with the pictures of the kings of France on horfeback. The hotel of the city is a handfome building, but hid by the houfes of the narrow ftreet in which it is placed. The cathedral church is a Gothic ftructure, with tombs of feveral earls of Provence, and fome good pictures by French mafters. The Corfe, or Orbitelle, is a magnificent walk, above 300 yards long, formed by a triple avenue of elms, and two rows of regular and ftately houfes. The church of the fathers of the oratory is a handfome building; and not far from thence is the chapel of the blue penitents, which is full of paintings. The convent of preachers is very fine; in their church is a filver ftatue of the Virgin Mary almoft as big as the life. There are other churches and buildings

Aix. buildings which contain a great number of rarities. The baths without the city, which were difcovered not long fince, have good buildings, raifed at a vaft expence, for the accommodation of thofe who drink the waters. Although Aix was the firft Roman fettlement in Gaul, it is not remarkable for ancient remains. The warm fprings from which it is now known and frequented induced Sextus Calvinus to found a colony here, to which he gave the name of *Aquæ Sextiæ*. They were fuppofed to poffefs particular virtues in cafes of debility; and feveral altars have been dug up facred to Priapus, the infcriptions on which indicate their gratitude to that deity for his fuppofed fuccour and affiftance. E. Long. 5. 32. N. Lat. 43. 32.

Aix, a fmall ifland on the coaft of France, between the ifle of Oleron and the continent. It is twelve miles north-weft of Rochfort, and twelve fouth-fouthweft of Rochelle. W. Long. 1. 4. N. Lat. 46. 5.

Aix la chapelle, a fine city of Germany, in the circle of Weftphalia and duchy of Juliers.

All authors are agreed about its antiquity, it being mentioned in Cæfar's Commentaries and the Annals of Tacitus. The Romans had colonies and fortreffes there, when they were at war with the Germans; but the mineral waters and the hot bath fo increafed its fame, that, in procefs of time, it was advanced to the privileges of a city, by the name of Aquægranii, that is, the waters of Granius; that which it has now, of *Aix la Chapelle*, was given it by the French, to diftinguifh it from the other Aix. It is fo called, on account of a chapel built in honour of the Holy Virgin by Charlemagne; who having repaired, beautified, and enlarged the city, which was deftroyed by the Huns in the reign of Attila in 451, made it the ufual place of his refidence. The town is feated in a valley furrounded with mountains and woods, and yet the air is very wholefome. It may be divided into the inward and outward city. The inward is incompaffed with a wall about three quarters of a league in circumference, having ten gates; and the outward wall, in which there are eleven gates, is about a league and a half in circumference. There are rivulets which run through the town and keep it very clean, turning feveral mills; befides twenty public fountains, and many private ones. They have ftone-quarries in the neighbourhood, which furnifh the inhabitants with proper materials for their magnificent buildings, of which the ftadt-houfe and the cathedral are the chief. There are likewife thirty parochial or collegiate churches. The market-place is very fpacious, and the houfes round it are ftately. In the middle, before the ftadt-houfe, is a fountain of blue ftones, which throws out water, from fix pipes, into a marble bafon placed beneath, thirty feet in circumference. On the top of this fountain, is placed the ftatue of Charlemagne, of brafs, gilt, holding a fceptre in his right-hand, and a globe in his left. The ftadt-houfe is adorned with the ftatues of all the emperors fince Charlemagne. This fabric has three ftories, the upper of which is one entire room of 162 feet in length and 60 in breadth. In this the new-elected emperor formerly entertained all the electors of the empire.

Aix la chapelle is a free imperial city, and changes its magiftracy every year on the eve of St John Baptift. The mayor is in the nomination of the elector palatine, in the quality of the duke of Juliers, as protector of the city. This place is famous for feveral councils and treaties of peace concluded here; particularly thofe between France and Spain in 1668, and between Great Britain and France in 1748. Aix.

The hot fulphurous waters for which this place has fo long been celebrated, arife from feveral fources, which fupply eight baths conftructed in different parts of the town. Thefe waters near the fources are clear and pellucid; and have a ftrong fulphureous fmell refembling the wafhings of a foul gun; but they lofe this fmell by expofure to air. Their tafte is faline, bitter, and urinous. They do not contain iron. They are alfo neutral near the fountain, but afterwards are manifeftly and pretty ftrongly alkaline, infomuch that clothes are wafhed with them without foap.—On the vaults above the fprings and aqueducts of thefe waters is found, every year, when they are opened, a quantity of fine white-coloured flowers of fulphur, which has been fublimed from the waters.

The heat of the water of the hotteft fpring, by Dr Lucas's account, raifes the quickfilver of Fahrenheit's thermometer to 136—by Monf. Monet's account, to 146—and the heat of the fountain, where they commonly drink, by Dr Lucas's account, to 112.

Dr Simmons has given the following account of their feveral temperatures, as repeatedly obferved by himfelf with a thermometer conftructed by Nairne.

The fpring which fupplies the Emperor's bath (*Bain de l'Empereur*), the New Bath (*Bain Neuf*), and the Queen of Hungary's bath (*Bain de la Reine Hongrie*), - - -	127°
St Quirin's bath (*Bain de St Quirin*), -	112
The Rofe bath (*Bain de la Rofe*), and the Poor's bath (*Bain des Pauvres*), both which are fupplied by the fame fpring, - - -	112°
Charles's bath (*Bain de Charles*), and St Corneille's bath (*Bain de St Corneille*), - -	112°
The fpring ufed for drinking is in the High Street, oppofite to Charles's bath; the heat of it at the pump is - -	106°

Dr Lucas evaporated the water of the hotteft fpring (of the Emperor's Bath), and obtained 268 grains of folid matter from a gallon, compofed of 15 grains of calcareous earth, 10 grains of felenites, and 243 grains of a faline matter made up of natron and fea falt. They are at firft naufeous and harfh, but by habit become familiar and agreeable. At firft drinking, alfo, they generally affect the head. Their general operation is by ftool and urine, without griping or diminution of ftrength; and they alfo promote perfpiration.

The quantity to be drank as an alterative is to be varied according to the conftitution and other circumftances of the patient. In general, it is beft to begin with a quarter or half a pint in the morning, and increafe the dofe afterwards to pints, as may be found convenient. The water is beft drank at the fountain. When it is required to purge, it fhould be drank in large and often-repeated draughts.

In regard to bathing, this alfo muft be determined by the age, fex, ftrength, &c. of the patient, and by the feafon. The degree of heat of the bath fhould likewife be confidered. The tepid ones are in general the beft, though there are fome cafes in which the hotter ones are moft proper. But even in thefe, it is beft to

Aizoon, Akenfide.

begin with the temperate baths, and increafe the heat gradually.

Thefe waters are efficacious in difeafes proceeding from indigeftion and from foulnefs of the ftomach and bowels. In rheumatifms; in the fcurvy, fcrophula, and difeafes of the fkin; in hyfteric and hypochondrial diforders; in nervous complaints and melancholy; in the ftone and gravel; in paralytic complaints; in thofe evils which follow an injudicious ufe of mercury; and in many other cafes. They ought not, however, to be given in hectic cafes where there is heat and fever, in putrid diforders, or where the blood is diffolved, or the conftitution much broken down.

The time of drinking, in the firft feafon, is from the beginning of May to the middle of June; and, in the latter feafon, from the middle of Auguft to the latter end of September.

There are galleries or piazzas under which the company walk during the time of drinking, in order to promote the operation of the waters.—The poor's bath is free for every body, and is frequented by crowds of poor people.

It is fcarcely neceffary to add, that there are all kinds of amufements common to other places of public refort; but the fharpers appear more fplendid here than elfewhere, affuming titles, with an equipage fuitable to them.—Aix la Chapelle is 21 miles from Spa, 36 from Liege, and 30 from Cologne. E. Long. 5. 48. N. Lat. 51. 55.

AIZOON, called by Mr Miller *fempervive;* though the name Aizoon has been by fome writers applied to the houfe-leek, and alfo to the aloes: A genus of the pentagynia order, belonging to the icofandria clafs of plants; and in the natural method ranking under the 13th order, *Succulentæ*. The characters are: The *calyx* is a fingle-leaved perianthium, divided into five fegments, and perfiftent: There is no *corolla:* The *ftamina* confift of very numerous capillary filaments; the antheræ are fimple: The *piftillum* has a five-cornered germen above, with five fimple ftyli; and the ftigmata are fimple. The *pericarpium* is a bellied, retufe, five-cornered capfule, having five cells and five valves: The *feeds* are many and globular.—Linnæus mentions three fpecies; the canarienfe, hifpanicum, and paniculatum. The firft is a native of the Canary iflands, the fecond of Spain, and the third of the Cape of Good Hope. They may all be raifed in this country on hot-beds; but as they are not remarkable either for beauty or any other property, it appears unneceffary to take further notice of them.

AKENSIDE (Mark), a phyfician, who publifhed in Latin "A Treatife upon the Dyfentery," in 1764, and a few pieces in the firft volume of the "Medical Tranfactions" of the college of phyficians, printed in 1768; but far better known, and to be diftinguifhed chiefly hereafter, as a poet. He was born at Newcaftle-upon-Tyne, November 9. 1721; and after being educated at the grammar-fchool in Newcaftle, was fent to the univerfities of Edinburgh and Leyden; at which laft he took his degree of Doctor in Phyfic. He was afterwards admitted by mandamus to the fame degree at Cambridge; elected a fellow of the college of phyficians, and one of the phyficians at St Thomas's Hofpital; and, upon the eftablifhment of the queen's houfehold, appointed one of the phyficians to her majefty.

Akenfide.

That Dr Akenfide was able to acquire no other kind of celebrity than that of a fcholar and a poet, is to be accounted for by the following particulars in his life and conduct, related by Sir John Hawkins.—Mr Dyfon and he were fellow-ftudents, the one of law and the other of phyfic, at Leyden; where, being of congenial tempers, a friendfhip commenced between them that lafted through their lives. They left the univerfity at the fame time, and both fettled in London: Mr Dyfon took to the bar, and being poffeffed of a handfome fortune, fupported his friend while he was endeavouring to make himfelf known as a phyfician; but in a fhort time, having purchafed of Mr Hardinge his place of clerk of the houfe of commons, he quitted Weftminfter-hall; and for the purpofe of introducing Akenfide to acquaintance in an opulent neighbourhood near the town, bought a houfe at North-End, Hampftead; where they dwelt together during the fummer-feafon, frequenting the long-room, and all clubs and affemblies of the inhabitants.

At thefe meetings, which, as they were not felect, muft be fuppofed to have confifted of fuch perfons as ufually meet for the purpofe of goffiping, men of wealth, but of ordinary endowments, and able to talk of little elfe than news, and the occurrences of the day. Akenfide was for difplaying thofe talents which had acquired him the reputation he enjoyed in other companies: but here they were of little ufe to him; on the contrary, they tended to engage him in difputes that betrayed him into a contempt of thofe that differed in opinion from him. It was found out that he was a man of low birth, and a dependent on Mr Dyfon; circumftances that furnifhed thofe whom he offended with a ground of reproach, that reduced him to the neceffity of afferting in terms that he was a gentleman.

Little could be done at Hampftead after matters had proceeded to this extremity: Mr Dyfon parted with his villa at North-End, and fettled his friend in a fmall houfe in Bloomfbury-fquare; affigning for his fupport fuch a part of his income as enabled him to keep a chariot.—In this new fituation Akenfide ufed every endeavour to become popular, but defeated them all, by the high opinion he everywhere manifefted of himfelf, and the little condefcenfion he fhowed to men of inferior endowments; by his love of political controverfy, his authoritative cenfure of the public councils, and his bigotted notions refpecting government; fubjects foreign to his profeffion, and with which fome of the wifeft of it have thought it prudent not to concern themfelves. In the winter evenings he frequented Tom's coffee-houfe in Devereux-court, then the refort of fome of the moft eminent men for learning and ingenuity of the time; with fome of whom he became intangled in difputes and altercations, chiefly on fubjects of literature and politics, that fixed on his character the ftamp of haughtinefs and felf-conceit, and drew him into difagreeable fituations. Hence many, who admired him for his genius and parts, were fhy of becoming his intimates.

The value of that precept which exhorts us to live peaceably with all men, or, in other words, to avoid creating enemies, can only be eftimated by the reflection on thofe many amiable qualities againft which the neglect of it will preponderate. Akenfide was a man of religion and ftrict virtue; a philofopher, a fcholar,

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and a fine poet. His converfation was of the moft delightful kind; learned, inftructive, and without any affectation of wit, cheerful and entertaining.

Dr Akenfide died of a putrid fever, June 23. 1770; and is buried in the parifh-church of St James's, Weftminfter.

His poems, publifhed foon after his death in 4to and 8vo, confift of "The Pleafures of Imagination," two books of "Odes," a "Hymn to the Naiads," and fome "Infcriptions." "The Pleafures of Imagination," his capital work, was firft publifhed in 1744; and a very extraordinary production it was from a man who had not reached his 23d year. He was afterwards fenfible, however, that it wanted revifion and correction; and he went on revifing and correcting it for feveral years: but finding this tafk to grow upon his hands, and defpairing of ever executing it to his own fatisfaction, he abandoned the purpofe of correcting, and refolved to write the poem over anew upon a fomewhat different and enlarged plan. He finifhed two books of his new poem, a few copies of which were printed for the ufe of the author and certain friends; of the firft book in 1757, of the fecond in 1765. He finifhed alfo a good part of a third book, and an introduction to a fourth; but his moft munificent and excellent friend, conceiving all that is executed of the new work, too inconfiderable to fupply the place, and fuperfede the republication of the original poem, and yet too valuable to be with-held from the public, hath caufed them both to be inferted in the collection of his poems.

AKIBA, a famous rabbin, flourifhed a little after the deftruction of Jerufalem by Titus. He kept the flocks of a rich citizen of Jerufalem till the 40th year of his age, and then applied himfelf to ftudy in the academies for 24 years; and was afterwards one of the greateft mafters in Ifrael, he having 24,000 fcholars. He declared for the impoftor Barcochebas, whom he owned for the Meffiah; and not only anointed him king, but took upon himfelf the office of his mafter of the horfe. The troops which the emperor Hadrian fent againft the Jews, who under the conduct of this falfe Meffiah had committed horrid maffacres, exterminated this faction. Akiba was taken, and put to death with great cruelty. He lived 120 years; and was buried with his wife in a cave upon a mountain not far from Tiberias, and his 24,000 fcholars were buried round about him upon the fame mountain. It is imagined he invented a fuppofititious work under the name of the patriarch Abraham.

AKISSAT, the ancient Thyatira, a city in Natolia, in Afia, fituated in a plain 18 miles broad, which produces plenty of cotton and grain. The inhabitants, who are reckoned to be about 5000, are faid to be all Mahometans. The houfes are built of nothing but earth or turf dried in the fun, and are very low and ill contrived: but there are fix or feven mofques, which are all of marble. There are remarkable infcriptions on marble in feveral parts of the town, which are part of the ruins of ancient Thyatira. It is feated on the river Hermus, 50 miles from Pergamos. E. Long. 28. 30. N. Lat. 38. 50.

AKOND, an officer of juftice in Perfia, who takes cognizance of the caufes of orphans and widows; of contracts, and other civil concerns. He is the head of the fchool of law, and gives lectures to all the fubaltern officers; he has his deputies in all the courts of the kingdom, who, with the fecond *fadra*, make all contracts.

AL, an Arabic particle prefixed to words, and fignifying much the fame with the Englifh particle *the*: Thus they fay, alkermes, alkoran, &c. i. e. the kermes, the koran, &c.

AL, or ALD, a Saxon term frequently prefixed to the names of places, denoting their antiquity; as Aldborough, Aldgate, &c.

ALA, a Latin term properly fignifying a wing; from a refemblance to which feveral other things are called by the fame name: Thus,

ALA, is a term ufed by botanifts for the hollow of a ftalk, which either the leaf, or the pedicle of the leaf, makes with it; or it is that hollow turning, or finus, placed between the ftalk or branch of a plant and the leaf, whence a new offspring ufually iffues. Sometimes it is ufed for thofe parts of leaves otherwife called *lobes*, or *wings*.

ALÆ (the plural number) is ufed to fignify thofe petals or leaves of papilionaceous flowers, placed between thofe others which are called the *vexillum* and *carina*, and which make the top and bottom of the flowers. Inftances of flowers of this ftructure are feen in thofe of peafe and beans, in which the top leaf or petal is the vexillum, the bottom the carina, and the fide ones the alæ.

ALÆ is alfo ufed for thofe extremely flender and membranaceous parts of fome feeds, which appear as wings placed on them; it likewife fignifies thofe membranaceous expanfions running along the ftems of fome plants, which are therefore called *alated ftalks*.

ALÆ, in anatomy, a term applied to the lobes of the liver, the cartilages of the noftril, &c.

ALÆ, in the Roman art of war, were the two wings or extreme parts of the army drawn up in order of battle.

ALABA, one of the three fmalleft diftricts of Bifcay in Spain, but pretty fertile in rye, barley, and fruits. There are in it very good mines of iron, and it had formerly the title of a kingdom.

ALABANDA (anc. geog.), a town of Caria, near the Meander, fituate beneath eminences refembling affes with pack-faddles, which gave rife to the jeft; and between Amyzo to the weft and Stratonice to the eaft. Under the Romans they enjoyed affifes, or a convention of jurifdiction, by Pliny reckoned the fourth in order; hence the proverb in Stephanus, expreffing their happinefs. It was built by Alabandus, whom therefore they deemed a god. The people were called *Alabandi*, *Alabandenfes*, Cicero; and *Alabandeis*, after the Greek manner, in coins of Auguftus and Claudius; they were alfo called *Alabandeni* (Livy).

ALABARCHA, in antiquity, a kind of magiftrate among the Jews of Alexandria, whom the emperors allowed them to elect, for the fuperintendency of their policy, and to decide differences and difputes which arofe among them.

ALABASTER (William), an Englifh divine, was born at Hadley in the county of Suffolk. He was one of the doctors of Trinity college in Cambridge; and he attended the earl of Effex as his chaplain in the expedition to Cadiz in the reign of queen Elizabeth. It is

Alabaster is ſaid, that his firſt reſolutions of changing his religion were occaſioned by his ſeeing the pomp of the churches of the Roman communion, and the reſpect with which the prieſts ſeemed to be treated amongſt them; and appearing thus to waver in his mind, he ſoon found perſons who took advantage of this diſpoſition of his, and of the complaints which he made of not being advanced according to his deſerts in England, in ſuch a manner, that he did not ſcruple to go over to the Popiſh religion, as ſoon as he found that there was no ground to hope for greater encouragement in his own country. However that matter is, he joined himſelf to the Romiſh communion, but was diſappointed in his expectations. He was ſoon diſpleaſed at this; he could not reconcile himſelf to the diſcipline of that church, which made no conſideration of the degrees which he had taken before. It is probable too that he could not approve of the worſhip of creatures, which proteſtants are uſed to look upon with horror. Upon this he returned to England, in order to reſume his former religion. He obtained a prebend in the cathedral of St Paul, and after that the rectory of Therfield in Hertfordſhire. He was well ſkilled in the Hebrew tongue; but he gave a wrong turn to his genius by ſtudying the Cabala, with which he was ſtrangely infatuated. He gave a proof of this in a ſermon which he preached upon taking his degree of doctor of divinity at Cambridge. He took for his text the beginning of the firſt book of Chronicles, Adam, Seth, Enos; and having touched upon the literal ſenſe, he turned immediately to the myſtical, aſſerting, that Adam ſignified misfortune and miſery, and ſo of the reſt. His verſes were greatly eſteemed. He wrote a Latin tragedy, intitled *Roxana;* which, when it was acted in a college at Cambridge, was attended with a very remarkable accident. There was a lady who was ſo terrified at the laſt word of the tragedy, *Sequar, Sequar*, which was pronounced with a very ſhocking tone, that ſhe loſt her ſenſes all her lifetime after. Alabaſter was living in 1630. His *Apparatus in Revelationem Jeſu Chriſti* was printed at Antwerp in 1607. As for his *Spiraculum tubarum, ſeu fons Spiritualium Expoſitionum ex æquivocis Pentaglotti ſignificationibus*, and his *Ecce Sponſus venit, ſeu tuba pulchritudinis, hoc eſt demonſtratio quod non ſit illicitum nec impoſſibile computare durationem mundi & tempus ſecundi adventus Chriſti*, they were printed at London. We may judge from theſe titles what the taſte and genius of the author was.

Alabaster, in natural hiſtory, a ſpecies of that genus of ſtones whoſe baſe is calcareous earth. It differs from marble in being combined, not with the aërial, but with vitriolic acid; therefore, when mixed with any acid, no efferveſcence appears. It is ſoluble in about 500 times its weight of water at the temperature of 60. It is fuſible alone in a long-continued porcelain heat, or by the blow-pipe. Specific gravity 1.87. Texture granular, with ſhining particles. In compoſition, and conſequently in its chemical properties, it does not differ from gypſum, ſelenite, and plaſter of Paris.

There are three ſpecies of alabaſter. 1. The ſnow-white ſhining alabaſter, or lygdinum of the ancients, is found in Taurus, in pieces large enough to make diſhes, or the like. It cuts very freely, and is capable of a fine poliſh. 2. The yellowiſh alabaſter, or phengites of Pliny, is found in Greece; and is of a ſoft looſe open texture, pretty heavy, and nearly of the colour of honey. This ſpecies has likewiſe been found in Germany, France, and in Derbyſhire in England. 3. Variegated, yellow, and reddiſh alabaſter. This ſpecies is the common alabaſter of the ancients, and is ſo ſoft that it may be cut with a knife: It is remarkably bright, and almoſt tranſparent; admits of a fine poliſh, and conſiſts of large angular ſparry concretions. It is not proof againſt water; it ferments violently with aqua-fortis, and burns to a pale yellow. The colour of this ſpecies is a clear pale yellow reſembling amber, and variegated with undulated veins; ſome of which are pale red, others whitiſh, and others of a pale brown. It was formerly brought from Egypt, but is now to be met with in ſeveral parts of England. The alabaſters are frequently uſed by ſtatuaries for ſmall ſtatues, vaſes, and columns. After being calcined and mixed with water, they may be caſt in any mould like plaſter of Paris. See Gypsum.

Alabaſter, Mr Boyle obſerves, being finely powdered, and thus ſet in a baſon over the fire, will, when hot, aſſume the appearance of a fluid, by rolling in waves, yielding to the ſmalleſt touch, and emitting vapour; all which properties it loſes again on the departure of the heat, and diſcovers itſelf a mere incoherent powder. The fineneſs and clearneſs of this ſtone renders it in ſome meaſure tranſparent; whence it has been ſometimes alſo employed for windows. There is a church at Florence ſtill illuminated by alabaſter-windows; inſtead of panes of glaſs, there are ſlabs of alabaſter near 15 feet high, each of which forms a ſingle window, through which the light is conveyed. The countries in Europe which abound moſt in alabaſter are Germany, toward Coblentz; the province of Maconnois, in the neighbourhood of Cluni in France; Italy, toward Rome; where that of Montaiout is particularly remarkable not only for its whiteneſs, but alſo for the bigneſs of its blocks, ſome of which are ſo large, that ſtatues as big as the life may eaſily be cut out of them. F. Labat, in his journey to Italy, obſerves, that there are quarries of alabaſter in the neighbourhood of the village called de la Toffa, near Civita Vecchia: there is alſo alabaſter to be found in ſome places of Lorrain; but it is not much eſteemed. A new manufacture of baſſo relievos, from a ſingular ſpecies of factitious alabaſter, has been ſome time ago eſtabliſhed by M. Letapie, at the baths of St Philip in Tuſcany. The ſtream at theſe baths depoſites a peculiar kind of ſand, which, when collected and condenſed in the cavities of any body employed to oppoſe its current, acquires the nature, hardneſs, and colour of alabaſter, and aſſumes the forms of thoſe cavities in which it is thus lodged.

Alabaster, in antiquity, a term uſed for a vaſe wherein odoriferous liquors were anciently put. The reaſon of the denomination is, that veſſels for this purpoſe were frequently made of the alabaſter-ſtone, which Pliny and other ancients repreſent as peculiarly proper for this purpoſe. Several critics will have the box mentioned in the Goſpels as made of alabaſter to have been of glaſs: And though the texts ſay that the woman broke it, yet the pieces ſeem miraculouſly to have been united, ſince we are told the entire box was purchaſed by the emperor Conſtantine, and preſerved as

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a relic of great price. Others will have it, that the name *alabaſter* denotes the form rather than the matter of this box: In this view they define alabaſter by a box without a handle, deriving the word from the privative α, and λαβη, *anſa, handle.*

Alabaſter is alſo ſaid to have been uſed for an ancient liquid meaſure, containing ten ounces of wine, or nine of oil. In this ſenſe, the alabaſter was equal to half the ſextary.

ALABASTRUM DENDROIDE, a kind of laminated alabaſter, beautifully variegated with the figures of ſhrubs, trees, &c. found in great abundance in the province of Hohenſtein.

ALADINISTS, a ſect among the Mahometans, anſwering to free-thinkers among us.

ALADULIA, a conſiderable province of Turky, in Aſia, in that part called Natolia, between the mountains of Antitaurus, which ſeparate it from Amaſia on the north, and from Carimania on the weſt. It has The Mediterranean ſea on the ſouth; and the Euphrates, or Frat, on the eaſt, which divides it from Diarbeker. It comprehends the Leſſer Armenia of the ancients, and the eaſt part of Cilicia. Formerly it had kings of its own; but the head of the laſt king was cut off by Selim I. emperor of the Turks, who had conquered the country. It is now divided into two parts: the north, comprehended between Taurus, Antitaurus, and the Euphrates, is a beglerbeglic, which bears the name of Maraſh, the capital town; and the ſouth, ſeated between mount Taurus and the Mediterranean, is united to the beglerbeglic of Aleppo. The country is rough, ragged, and mountainous; yet there are good paſtures, and plenty of horſes and camels. The people are hardy and thieviſh. The capital is Malatigah.

ALAIN (Chartier), ſecretary to Charles VII. king of France, born in the year 1386. He was the author of ſeveral works in proſe and verſe; but his moſt famous performance was his Chronicle of King Charles VII. Bernard de Girard, in his preface to the Hiſtory of France, ſtyles him "an excellent hiſtorian, who has given an account of all the affairs, particulars, ceremonies, ſpeeches, anſwers, and circumſtances, at which he was preſent himſelf, or had information of." Giles Coroxet tells us, that Margaret, daughter to the king of Scotland, and wife to the dauphin, paſſing once through a hall where Alain lay aſleep, ſhe ſtopped and kiſſed him before all the company who attended: ſome of them telling her, that it was ſtrange ſhe ſhould kiſs a man who had ſo few charms in his perſon, ſhe replied, "I did not kiſs the man, but the mouth from whence proceed ſo many excellent ſayings, ſo many wiſe diſcourſes, and ſo many elegant expreſſions." Mr Fontenelle, among his Dialogues of the Dead, has one upon this incident, between the princeſs Margaret and Plato. Mr Paſquier compares Alain to Seneca, on account of the great number of beautiful ſentences interſperſed throughout his writings.

ALAIS, a conſiderable town of France, in the province of Languedoc, ſituated on the river Gardon, at the foot of the Cevennes. The Jeſuits had a college in this place; and a fort was built here in 1689. It is 34 miles north of Montpellier, and 340 from Paris. E. Lon. 4. 20. N. Lat. 44. 8.

ALAMANDUS (Lewis), in French *Aleman*, archbiſhop of Arles, and cardinal of St Cecilia, was one of the greateſt men of the fifteenth century. The cardinal preſided in the council of Baſil, which depoſed Eugenius IV. and elected the antipope Felix V. He is much commended by Æneas Sylvius, as a man extremely well formed for preſiding in ſuch aſſemblies, firm and vigorous, illuſtrious by his virtue, learned, and of an admirable memory in recapitulating all that the orators and diſputants had ſaid. One day, when he harangued againſt the ſuperiority of the pope over the council, he diſtinguiſhed himſelf in ſuch an eminent manner, that ſeveral perſons went to kiſs him, while others preſſed even to kiſs his robe. They extolled to the ſkies his abilities and genius, which had raiſed him, though a Frenchman, to a ſuperiority over the Italians, notwithſtanding all their natural ſubtlety and fineſſe. There is no need of aſking, whether Pope Eugenius thundered againſt the preſident of a council which depoſed him. He deprived him of all his dignities, and treated him as a ſon of iniquity. However, notwithſtanding this, Lewis Alamandus died in the odour of ſanctity, and performed ſo many miracles after his death, that at the requeſt of the canons and Celeſtine monks of Avignon, and the ſolicitation of the cardinal of Clermont legate *a latere* of Clement VII. he was beatified by that pope in the year 1527.

ALAMANNI (Lewis) was born at Florence, of a noble family, on the 28th of October 1495. He was obliged to fly his country for a conſpiracy againſt Julius de Medici, who was ſoon after choſen pope under the name of Clement VII. During this voluntary baniſhment, he went into France; where Francis I. from a love to his genius and merit, became his patron. This prince employed him in ſeveral important affairs, and honoured him with the collar of the order of St. Michael. About the year 1540, he was admitted a member of the Inflammati, an academy newly erected at Padua, chiefly by Daniel Barbaro and Ugolin Martelli. After the death of Francis, Henry duke of Orleans, who ſucceeded him in 1537, ſhowed no leſs favour to Alamanni; and in the year 1551, ſent him as his ambaſſador to Genoa: this was his laſt journey to Italy; and being returned to France, he died at Amboiſe on the 18th of April 1556, being in the 61ſt year of his age. He left many beautiful poems, and other valuable performances, in the Italian language. We have alſo ſome notes of his upon Homer's Iliad and Odyſſey; thoſe upon the Iliad were printed in the Cambridge edition of Homer in 1689, and Joſhua Barnes has alſo inſerted them in his fine edition of Homer in 1711.

ALAMODALITY, in a general ſenſe, is the accommodating a perſon's behaviour, dreſs, and actions, to the prevailing taſte of the country or times in which he lives.

ALAMODALITY of writing, is defined the accommodation of mental productions, both as to the choice of ſubject and the manner of treating it, to the genius or taſte of the times, in order to render them more acceptable to the readers.

ALAMODE, a phraſe originally French, importing a thing to be in the faſhion or mode. The phraſe has been adopted not only into ſeveral of the living languages, as the Engliſh and High-Dutch, but ſome have even taken it into the Latin. Hence we meet with *Alamodicus* and *Alamodalitas*.

ALAMODE, in commerce, a thin gloſſy black ſilk, chiefly uſed for womens hoods and mens mourning ſcarfs.

ALAMOS (Balthaſar), a Spaniſh writer, born at Medina del Campo in Caſtile. After having ſtudied the law at Salamanca, he entered into the ſervice of Anthony Perez, ſecretary of ſtate under Philip II. He was in high eſteem and confidence with his maſter, upon which account he was impriſoned after the diſgrace of this miniſter. He was kept in confinement 11 years, when Philip III. coming to the throne, ſet him at liberty, according to the orders given by his father in his will. Alamos continued in a private capacity, till the duke of Olivarez, the favourite of Philip IV. called him to public employments. He was a man of wit as well as judgment, but his pen was ſuperior to his tongue. He died in the 88th year of his age. His Spaniſh tranſlation of Tacitus, and the aphoriſms which he added in the margin, gained him great reputation. This work was publiſhed at Madrid in 1614; and was to have been followed, as mentioned in the king's privilege, with a commentary, which however has never yet appeared. The author compoſed the whole during his impriſonment.

ALAN (Cardinal William), was born at Roſſal in Lancaſhire, in the year 1532. He went to Oxford at the age of 15, and in 1550 was elected fellow of Oriel college. In 1556, being then only 24 years old, he was choſen principal of St Mary's hall, and one of the proctors of the univerſity. In 1558 he was made canon of York; but, upon queen Elizabeth's acceſſion to the throne, he left England, and ſettled at Louvain in an Engliſh college, of which he became the chief ſupport. In 1565 he viſited his native country; but, on account of his extreme activity in the propagation of the Roman Catholic religion, he was obliged to fly the kingdom in 1568. He went firſt to Mechlin, and then to Doway, where he was made doctor of divinity. Soon after, he was appointed canon of Cambray, and then canon of Rheims. He was created cardinal on the 28th of July 1587, by the title of *St Martin in Montibus*; and obtained from the king of Spain a rich abbey in the kingdom of Naples, and afterwards the biſhoprick of Mechlin. It is ſuppoſed to have been by the advice and inſtigation of this prieſt, that Philip II. attempted to invade England. He died on the 20th of October 1594, aged 63; and was buried in the Engliſh college at Rome. He was a man of conſiderable learning, and an elegant writer. He wrote many books in defence of the Romiſh religion. The moſt remarkable are, 1. *A defence of the 12 martyrs in one year.* Tho. Alfield was hanged for bringing, and publiſhing, this and other of Alan's works, into England, in the year 1584. 2. *A declaration of the ſentence of Sextus V.* &c. A work intended to explain the pope's bull for the excommunication of queen Elizabeth, and to exhort the people of England to take up arms in favour of the Spaniards. Many thouſand copies of this book, printed at Antwerp, were put on board the Armada; but the enterpriſe failing, they were afterwards deſtroyed. 3. *Of the worſhip due to ſaints and their relicts* 1583. This treatiſe was anſwered by Lord Burleigh, and is eſteemed the moſt elegant of the Cardinal's writings.

ALAND, an iſland of the Baltic ſea, between Sweden and Finland, ſubject to the former. It lies between 17 and 19 degrees of E. long. and between 59 and 61 degrees of Lat. at the entrance of the gulph of Bothnia.

ALARAF, in the Mahometan theology, the partition wall that ſeparates heaven from hell. The word is plural, and properly written *al araf*; in the ſingular it is written *al arf.* It is derived from the Arabic verb *arafa*, to diſtinguiſh. Al araf gives the denomination to the ſeventh chapter of the alcoran, wherein mention is made of this wall. Mahomet ſeems to have copied his al araf, either from the great gulf of ſeparation mentioned in the New Teſtament, or from the Jewiſh writers, who alſo ſpeak of a thin wall dividing heaven from hell. Mahometan writers differ extremely as to the perſons who are to be found on al araf. Some take it for a ſort of limbus for the patriarchs, prophets, &c. others place here ſuch whoſe goo[illegible]d evil works ſo exactly balance each other, that th[illegible] neither reward nor puniſhment. Others imag[illegible] intermediate ſpace to be poſſeſſed by thoſe who, going to war without their parents leave, and ſuffering martyrdom there, are excluded paradiſe for their diſobedience, yet eſcape hell becauſe they are martyrs.

ALARBES, a name given to thoſe Arabians who live in tents, and diſtinguiſh themſelves by their dreſs from the others who live in towns.

ALARES, in Roman antiquity, an epithet given to the cavalry, on account of their being placed in the two wings of the army.

ALARIC, a famous general of the Goths. He entered Thrace at the head of 2[illegible]0,000 men, and laid waſte all the country through which he paſſed. He marched next to Macedonia and Theſſaly: the Theſſalians met him near the mouth of the river Peneas, and killed about 3000 of his army; nevertheleſs he advanced into Greece, and after having ravaged the whole country, returned to Epirus, loaded with immenſe ſpoils: after ſtaying here five years, he reſolved to turn his arms to the weſt. He marched through Pannonia; and, finding little reſiſtance, entered Italy, under the conſulſhip of Stilicho and Aurelianus, A.D. 400. After various battles and treaties, he at laſt took Rome by treachery, and permitted his ſoldiers to plunder it; this happened A.D. 409. Alaric, having laid waſte a great part of Italy, intended to paſs into Sicily; but a ſtorm obliging him to land again, he beſieged the city of Coſenza; and having took it, he died there in 411, eleven years after he firſt entered Italy.

ALARM, in the military art, denotes either the apprehenſion of being ſuddenly attacked; or the notice thereof, ſignified by firing a cannon, firelock, or the like. Falſe alarms are frequently made uſe of, to harraſs the enemy, by keeping them conſtantly under arms. Sometimes alſo this method is taken to try the vigilance of the piquet-guard, and what might be expected from them in caſe of real danger.

ALARM-Bell, that rung upon any ſudden emergency, as a fire, mutiny, or the like.

ALARM-Poſt, or *ALARM-place*, the ground for drawing up each regiment in caſe of an alarm. This is otherwiſe called *the rendezvous.*

ALARM, in fencing, is the ſame with what is otherwiſe called an appeal, or challenge.

ALASCANI, in church-hiſtory, a ſect of Antilutherans,

therans, whose distinguishing tenet, besides their denying baptism, is said to have been this, that the words, *This is my body*, in the institution of the eucharist, are not to be understood of the bread, but of the whole action, or celebration of the supper. They are said to have taken the name from one Joannes a Lasco, a Polish baron, superintendant of the church of that country, in England. See the next article.

ALASCO (John), a Polish nobleman of the 16th century, who, imbibing the reformed opinions, was expelled his country, and became preacher to a Protestant congregation at Embden; but foreseeing persecution there, came to England about the year 1551, while the reformation was carrying on under Edward the VI. The publication of the Interim driving the Protestants to such places as afforded them toleration, 380 were naturalized here, and obtained a charter of incorporation, by which they were erected into an ecclesiastical establishment, independent on the church of England. The Augustine friars church was granted them, with the revenues, for the maintenance of Alasco as superintendant, with four assistant ministers, who were to be approved by the king: and this congregation lived undisturbed until the accession of Queen Mary, when they were all sent away. They were kindly received and permitted to settle at Embden; and Alasco at last, after an absence of 20 years, by the favour of Sigismund, returned to his own country, where he died in 1560. Alasco was much esteemed by Erasmus, and the historians of his time speak greatly in his praise: we have of his writing, *De Cœna Domini liber; Epistola continens summam Controversiæ de Cœna Domini*, &c. He had some particular tenets; and his followers are called *Alascani* in church-history.

ALATAMAHA, a large river of North America, which, rising in the Apalachian mountains, runs southeast through the province of Georgia, and falls into the Atlantic ocean, below the town of Frederica.

ALATERNUS, in botany, the trivial name of a species of the rhamnus. See RHAMNUS.

ALAVA, a district of Spain, about 20 miles in length, and 17 in breadth, containing very good iron mines. Victoria is the capital town.

ALAUDA, or LARK, in ornithology, a genus of birds of the order of passeres; the characters of which are these: The beak is cylindrical, subulated, straight; and the two mandibles or chaps are of equal size. The tongue is bifid, and the hinder claw is straight, and longer than the toe. There are 28 species of the alauda, of which the following are the most remarkable. 1. The arvensis, or common sky-lark. This and the wood-lark are the only birds that sing as they fly; this raising its note as it soars, and lowering it till it quite dies away as it descends. It will often soar to such a height, that we are charmed with the music when we lose sight of the songster; it also begins its song before the earliest dawn. Milton, in his Allegro, most beautifully expresses these circumstances; and bishop Newton observes, that the beautiful scene that Milton exhibits of rural cheerfulness, at the same time gives us a fine picture of the regularity of his life, and the innocency of his own mind: thus he describes himself as in a situation

To hear the lark begin his flight,
And singing startle the dull night,
From his watch-tow'r in the skies,
Till the dappled dawn doth rise.

It continues its harmony several months, beginning early in the spring, on pairing. In the winter they assemble in vast flocks, grow very fat, and are taken in great numbers for our tables. They build their nest on the ground, beneath some clod, forming it of hay, dry fibres, &c. and lay four or five eggs.—The place these birds are taken in the greatest quantity, is the neighbourhood of Dunstable: the season begins about the 14th of September, and ends the 25th of February; and during that space, about 4000 dozen are caught, which supply the markets of the metropolis. See BIRD-*Catching*. Vastly greater numbers than the above, however, are at times caught in different parts of Germany, where there is an excise upon them. Keysler says, that the excise alone produces 6000 dollars (about L.900 Sterling) every year to the city of Leipsic; whose larks are famous all over Germany as having the most delicate flavour. But it is not only at Leipsic that they are taken in such numbers, but also in the country about Naumburg, Merseburg, Halle, and other parts.—2. The pratensis, or tit-lark, has the two outward feathers of the wing edged with white, and frequents the meadows. It is found frequently in low marshy grounds: like other larks, it builds its nest among the grass, and lays five or six eggs. Like the wood-lark, it sits on trees; and has a most remarkable fine note, singing in all situations, on trees, on the ground, while it is sporting in the air, and particularly in its descent. This bird, with many others, such as the thrush, black-bird, willow-wren, &c. become silent about midsummer, and resume their notes in September: hence the interval is the most mute of the year's three vocal seasons, spring, summer, and autumn. Perhaps the birds are induced to sing again as the autumnal temperament resembles the vernal.—3. The arborea, or wood-lark, is a native of Europe, and is distinguished by an annular white fillet about the head. It is inferior in size to the sky-lark, and is of a shorter thicker form; the colours are paler, and its note is less sonorous and less varied, though not less sweet. It perches on trees, and whistles like the black-bird. It will sing in the night; and, like the common lark, will sing as it flies. It builds on the ground, and makes its nest on the outside with moss, within of dried bents, lined with a few hairs. It lays five eggs, dusky and blotched with deep brown marks, darkest at the thicker end. The males of this and the last are known from the females by their superior size. But this species is not near so numerous as that of the common kind.—4. The campestris, has one half of its chief feathers of the wings brown, except two in the middle which are white, and the throat and breast are yellowish.—5. The trivialis, whose chief feathers on the tail are brown, only half of the outermost is white, and the second is white at the end, in the shape of a wedge; there is likewise a double whitish line on the wings. It is a native of Sweden, and perches on the top of trees.—6. The cristata: the chief tail-feathers are black, but the two outermost are edged with white, and the head is crested. It is a native of Europe. It sings well, like the sky-lark; lays four or five eggs; and is said to hatch twice in a year.—7. The spinoletta: the chief tail-feathers are black, only

only the outermoſt two are obliquely half white. It is a native of Italy.—8. The alpeſtris: the chief wing-feathers are half white, the throat yellow, and it has a black ſtreak under the eyes and on the breaſt. It inhabits North America, where it is migratory. It viſits the neighbourhood of Albany the beginning of May, but goes farther north to breed. In winter it comes in vaſt flocks into Virginia and Carolina, returning North in ſpring. It feeds, during its ſtay in the more ſouthern parts, on oats and other grain; and while at Albany, on the graſs and the buds of ſprig-birch. It runs into holes; whence the natives of theſe laſt parts have given it the name of *chi-chup-pi-ſue*. The Engliſh call it the *ortalon*, and reckon it delicious eating. By ſome it is called *ſnow bird*, as being very plenty in that ſeaſon. It is frequently caught in great numbers by means of horſe-hair ſpringes placed in ſome bare place, the ſnow being ſcraped away, and a little chaff ſtrewed about. It is always ſeen on the ground, and has little or no ſong. This bird is not peculiar to North America: we hear of it in Germany alſo; and is in plenty throughout Ruſſia and Sibiria, going northward in ſpring.—9. The magna, is yellow on the belly, with a crooked black ſtreak on the breaſt, and the three ſide-feathers of the tail white. It is a native of Africa and America.—10. The New Zealand lark (Plate XVI.) is ſeven and a half inches in length: the bill is half an inch, of a pale aſh-colour, with the upper part black: the upper parts of the body are duſky, edged with pale aſh-colour: the breaſt and belly are white: the legs reddiſh aſh-colour, and the claws black. It inhabits Charlotte Sound, and is called *kogoo aroùre*.

ALAUTA, a conſiderable river of Turkey in Europe, which, after watering the north-eaſt part of Tranſylvania and part of Wallachia, falls into the Danube almoſt oppoſite to Nicopolis.

ALAY, ſignifying in the Turkiſh language "The Triumph," a ceremony which accompanies the aſſembling together the forces of that vaſt empire upon the breaking out of a war. It conſiſts of the moſt inſipid buffoonery, and is attended with acts of the moſt ſhocking barbarity. That which took place upon occaſion of the late war between the Porte and Ruſſia is deſcribed by Baron Tott in his Memoirs as follows.

"It conſiſts in a kind of maſquerade, in which each trade ſucceſſively preſents to the ſpectators the mechanical exerciſe of its reſpective art. The labourer draws his plough, the weaver handles his ſhuttle, the joiner his plane; and theſe different characters, ſeated in cars richly ornamented, commence the proceſſion, and precede the ſtandard of Mahomet, when it is brought out of the ſeraglio to be carried to the army, in order to inſure victory to the Ottoman troops.

"This banner of the Turks, which they name *Sandjak-Cheriff*, or The Standard of the Prophet, is ſo revered among them, that, notwithſtanding its reputation has been ſo often tarniſhed, it ſtill retains their implicit confidence, and is the ſacred ſignal unto which they rally. Every thing proclaims its ſanctity. None but the emirs are allowed to touch it; they are its guards, and it is carried by their chief. The Muſſulmen alone are permitted to look upon it. If touched by other hands, it would be defiled; if ſeen by other eyes, profaned. In ſhort, it is encompaſſed by the moſt barbarous fanaticiſm.

"A long peace had unfortunately cauſed the ridiculouſneſs, and eſpecially the danger, of this ceremony to be forgotten. The Chriſtians imprudently crowded to ſee it; and the Turks, who, by the ſituation of their houſes, could make money of their windows, began to profit by the advantage; when an emir, who preceded the banner, proclaimed with a loud voice, 'Let no infidel dare to profane with his preſence the holy ſtandard of the prophet; and let every Muſſulman who perceives an unbeliever make it known under pain of reprobation.'

"From that moment no aſylum was to be found; even thoſe became informers, who, by letting out their houſes, had rendered themſelves accomplices in the crime. A religious fury ſeized on every mind, and put arms in every hand; the more atrocious the cruelty, the more was it meritorious. No regard was paid to ſex or age; pregnant women, dragged by the hair, and trodden under feet by the multitude, periſhed in the moſt deplorable manner. Nothing was reſpected by theſe monſters; and under ſuch auſpices the Turks commenced the war."

ALB, or ALBE, in the Romiſh church, a veſtment of white linen hanging down to the feet, and anſwering to the ſurplice of the Engliſh clergy. In the ancient church, it was uſual, with thoſe newly baptized, to wear an alb, or white veſtment; and hence the Sunday after Eaſter was called *dominica in albis*, on account of the albs worn by thoſe baptized on eaſter-day.

ALB is alſo a name of a Turkiſh coin, otherwiſe called *aſper*. See ASPER.

ALBA (anc. geog.), a town of the Marſi in Italy, ſituated on the north-ſide of the Lacus Fucinus, ſtill retaining in its name. It ſtands upon an eminence, and is noted in Roman hiſtory for being the ſtate priſon where captive princes were ſhut up, after being barbarouſly dragged through the ſtreets of Rome at the chariot wheels of a triumphant conſul. Perſes king of Macedon terminated his wretched career in this confinement, with his ſon, the laſt hope of an illuſtrious line of kings. Syphax the Numidian, and Bituinus king of the Averni, were alſo condemned to this gaol by the particular clemency of the ſenate, which ſometimes indulged its ſavage diſpoſition by putting its captives to death.

Alba being ſituated in the centre of Italy, amidſt difficult mountainous paſſes, and far from all means of eſcape, was eſteemed a moſt proper place for the purpoſe of guarding priſoners of importance. Artificial ſtrength was added to its natural ſecurity by fortifications, which remain to this day in a ſtate that proves their ancient ſolidity. For the entertainment of the garriſon, which was required in a place of ſuch conſequence, an amphitheatre was erected, of which the ruins are ſtill valuable, as well as the foundations of a temple, and other buildings of Roman times.

Lucius Vitellius, brother to the emperor of that name, had a villa near this place, famous for the variety and excellence of its fruit-trees, which he had brought from Syria. His gardens were the nurſeries where ſeveral of the moſt delicious ſtone-fruits, that are now ſo common in Europe, were firſt cultivated and multiplied.

It must have been necessary at Alba to shelter trees transplanted from Asia, and to treat them with great tenderness and care, in order to rear them to perfection: for the climate of this high region is extremely rigorous in winter; the cold season lasts long, and is accompanied with violent storms of wind and falls of snow. The lake has been often frozen entirely over.

Alba Firma, or *Album*, in our old customs, denoted rent paid in silver, and not in corn, which was called *black-mail*.

Alba Terra, one of the numerous names for the philosopher's stone.

Alba Regalis. See Stul Weissenburgh.

Alba Helviorum, or *Albaugusta*, (anc. geog.), afterwards called *Vivarium*, now *Viviers*, in the south-east of Languedoc, on the Rhone. In the lower age the inhabitants were called *Albenses*, and their city *Civitas Albensium*, in the Notitia Galliæ. E. Long. 4. 45. Lat. 44. 50.

Alba Julia (anc. geog.), now *Weissenburg*, a town of Transylvania, on the river Marisius, or Merisch, to the west of Hermanstat, supposed to be called *Alba Julia*, after Julia Domna the mother of Caracalla. There are, however, several inscriptions found at or near Weissenburg, which bear Col. Apul. that is *Colonia Apulensis*, without the least mention of *Alba Julia*, though inscribed after Caracalla's time. Add, that Ulpian, reciting the colonies of Dacia, calls this colony *Apulensis*, and neither *Alba* nor *Julia*. Whence there is a suspicion, that *Alba Julia* is a corruption of *Apulum*. It was also called *Apulum Augustum*. E. Long. 25. 0. Lat. 46. 46.

Alba Longa (anc. geog.), a colony from Lavinium, in Latium, established by Ascanius the son of Æneas, at the foot of the Mons Albanus: called *Alba*, from a white sow found by Æneas, which farrowed 30 white pigs on that spot; which circumstance was interpreted to portend the building of a city there in 30 years after (Propertius). The epithet *Longa* was added on account of its length. It was the royal residence till the building of Rome, as was foretold by Anchises (Virgil); was destroyed by Tullius Hostilius, all but the fane or temple; and the inhabitants were transplanted to Rome (Strabo).

Alba Pompeia (anc. geog.), on the river Ceba, now *Ceva*, in Liguria, the birth-place of the emperor Pertinax; a colony either established at first by Pompey, or re-established by him after having been before settled by Scipio. The inhabitants were called *Alpenses Pompeiani*. At this day the town is simply called *Alba*, without any epithet.

ALBAHURIM, *figura sexdecim laterum*, a figure of great importance according to astrological physicians, who built their prognostics on it.

ALBAN (St) is said to have been the first person who suffered martyrdom for Christianity in Britain; he is therefore usually styled the protomartyr of this island. He was born at Verulam, and flourished towards the end of the third century. In his youth he took a journey to Rome, in company with Amphibalus a monk of Caerleon, and served seven years as a soldier under the emperor Dioclesian. At his return home, he settled in Verulam; and, through the example and instructions of Amphibalus, renounced the errors of paganism, in which he had been educated, and became a convert to the Christian religion. It is generally agreed, that Alban suffered martyrdom during the great persecution under the reign of Dioclesian; but authors differ as to the year when it happened: Bede and others fix it in 286; some refer it to the year 296; but Usserius reckons it amongst the events of 303. The story and circumstances relating to his martyrdom, according to Bede, are as follows. Being yet a pagan (or at least it not being known that he was a Christian), he entertained Amphibalus in his house. The Roman governor being informed thereof, sent a party of soldiers to apprehend Amphibalus; but Alban, putting on the habit of his guest, presented himself in his stead, and was carried before that magistrate. The governor having asked him of what family he was? Alban replied, "To what purpose do you inquire of my family? if you would know my religion, I am a Christian." Then being asked his name, he answered, "My name is Alban; and I worship the only true and living God, who created all things." The magistrate replied, "If you would enjoy the happiness of eternal life, delay not to sacrifice to the great gods." Alban answered, "The sacrifices you offer are made to devils; neither can they help the needy, or grant the petitions of their votaries." His behaviour so enraged the governor, that he ordered him immediately to be beheaded. In his way to execution, he was stopped by a river, over which was a bridge so thronged with spectators that it was impossible to cross it; the saint, as we are told, lifted up his eyes to heaven, and the stream was miraculously divided, and afforded a passage for himself and a thousand more persons. Bede does not indeed give us the name of this river; but, notwithstanding this omission, the miracle, we suppose, will not be the less believed. This wonderful event converted the executioner upon the spot, who threw away his drawn sword, and, falling at St Alban's feet, desired he might have the honour to die with him. This sudden conversion of the headsman occasioning a delay in the execution till another person could be got to perform the office, St Alban walked up to a neighbouring hill, where he prayed for water to quench his thirst, and a fountain of water sprung up under his feet: here he was beheaded, on the 23d of June. The executioner is said to have been a signal example of divine vengeance; for as soon as he gave the fatal stroke, his eyes dropt out of his head. We may see the opinion of Mr Milton in regard to this narrative, in his History of England. His words are these, speaking of St Alban, "The story of whose martyrdom, soiled and worse martyred with the fabling zeal of some idle fancies, more fond of miracles than apprehensive of the truth, deserves no longer digression." Between 4 or 500 years after St Alban's death, Offa, king of the Mercians, built a very large and stately monastery to his memory; and the town of St Albans in Hertfordshire takes its name from our protomartyr.

ALBANA (anc. geog.), a sea-port town of Albania, on the Caspian sea, between the rivers Casius and Albanus; now called *Bachu*, or *Bachy*, giving name to the Caspian sea, viz. *Mar de Bahu*. E. Long. 49. 0. Lat. 40. 0.

ALBANENSES, in church-history, the same with Albigenses, according to some; according to others, different. Those, however, who are for distinguishing

them, attribute the ſame opinions to both; only making the Albanenſes to have been prior in reſpect of time, as having been found towards the cloſe of the eighth century; whereas the Albigenſes appeared not till the twelfth. See ALBIGENSES.

ALBANI, in Roman antiquity, a college of the *ſalii*, or prieſts of Mars; ſo called from mount Albanus, the place of their reſidence. See SALII.

ALBANI (Francis), a celebrated painter, born in Bologna, March 17, 1578. His father was a ſilk merchant, and intended to bring up his ſon to that buſineſs; but Albani having a ſtrong inclination to painting, when his father died, devoted himſelf entirely to that art, though then but twelve years of age. He firſt ſtudied under Denys Calvert; Guido Rheni being at the ſame time under this maſter, with whom Albani contracted a very great friendſhip. Calvert drew but one profile for Albani, and afterwards left him entirely to the care of Guido; under whom he made great improvement, his fellow-diſciple inſtructing him with the utmoſt humanity and good humour. He followed Guido to the ſchool of the Caraches: but a little after their friendſhip for each other began to cool; which was owing perhaps to the pride of Albani, who could not bear to ſee Guido ſurpaſs him, or to the jealouſy of Guido at finding Albani make ſo ſwift a progreſs. They certainly endeavoured to eclipſe one another; for when Guido had ſet up a beautiful altar-piece, Albani would oppoſe to it ſome fine picture of his: thus did they behave for ſome time, and yet ſpake of each other with the higheſt eſteem. Albani, after having greatly improved himſelf under the Caraches, went to Rome, where he continued many years, and married in that city; but his wife dying in childbed, at the earneſt requeſt of his relations he returned to Bologna, where he entered again into the ſtate of matrimony. His ſecond wife (Doralice) was well deſcended, but had very little fortune; which he perfectly diſregarded, ſo ſtrongly was he captivated with her beauty and good ſenſe. Albani, beſides the ſatisfaction of poſſeſſing an accompliſhed wife, reaped likewiſe the advantage of having a moſt beautiful model; ſo that he had now no occaſion to make uſe of any other woman to paint a Venus, the Graces, Nymphs, and other deities, whom he took a particular delight in repreſenting. His wife anſwered this purpoſe admirably well; for beſides her bloom of youth, and the beauty of her perſon, he diſcovered in her ſo much modeſty, ſo many graces and perfections, ſo well adapted to painting, that it was impoſſible for him to meet with a more finiſhed woman. She afterwards brought him ſeveral boys, all extremely beautiful and finely proportioned; ſo that ſhe and her children were the originals of his moſt agreeable and graceful compoſitions. Doralice was ſo conformable to his intentions, that ſhe took a pleaſure in ſetting the children in different attitudes, holding them naked, and ſometimes ſuſpended by ſtrings, when Albani would draw them in a thouſand different ways. It was from them, too, that the famous ſculptors Flamand and Argaldi modelled their little Cupids.

Albani was of a happy temper and diſpoſition; his paintings, ſays Malvaſia, breathing nothing but content and joy. Happy in a force of mind that conquered every uneaſineſs, his poetical pencil carried him through the moſt agreeable gardens to Paphos and Cītheria: thoſe delightful ſcenes brought him over the lofty Parnaſſus to the delicious abodes of Apollo and the Muſes; whence what Du Freſnoy ſays of the famous Giulio Romano may be juſtly applied to Albani:

Taught from a child in the bright Muſes' grots,
He open'd all the treaſures of Parnaſſus,
And in the lovely poetry of painting
The myſt'ries of Apollo has reveal'd.

He died the 4th of October 1660, to the great grief of all his friends and the whole city of Bologna. Malvaſia has preſerved ſome verſes of Franciſco de Lemene, intended for his monument; the ſenſe whereof is, "That the mortal remains of the illuſtrious Albani, he who gave life to ſhade, lie interred in this tomb: the earth never produced ſo wonderful an artiſt, or a hand equal to his immortal one; which gave colours to the ſoul, and a ſoul to colours. Prometheus animated clay, and gave life by means of the ſun; but Albani animated merely by the aſſiſtance of ſhade." He was very famous in his lifetime, and had been viſited by the greateſt painters. Several princes honoured him with letters; and amongſt the reſt King Charles I. who invited him to England by a letter ſigned with his own hand.

ALBANIA, a province of Turky in Europe, on the gulph of Venice, bounded by Livadia on the ſouth, by Theſſaly and Macedonia on the eaſt, and on the north by Boſnia and Dalmatia. The people are ſtrong, large, courageous, and good horſemen; but are ſaid to be of a thieviſh diſpoſition: the grand ſeignior procures excellent ſoldiers from hence, particularly cavalry, known by the name of *Arnauts*. There are ſeveral large towns in this province; and the inhabitants are almoſt all Chriſtians of the Greek church, and deſcended from the ancient Scythians. Formerly it was part of the kingdom of Macedonia. Their chief manufacture is carpets. The principal places are Durazzo, Velona, Antivari, Scutari, Croya, Aleſſo, Dibra, Dolcigno, and Albanapoli. Long. from 28° to 31° E. Lat. from 39° to 43° N.

ALBANIA, a country of Aſia, bounded on the weſt by Iberia; on the eaſt by the Caſpian ſea; on the north by mount Caucaſus; on the ſouth by Armenia, and the river Cyrus, now Kur; which, ſpringing from the Moſchian mountains that ſeparate Colchis from Armenia, and watering the country of Mokan, receives the Aragus and Araxes, and falls into the Caſpian ſea within a ſmall diſtance from the ſouthern borders of this country.—The whole country formerly called *Albania*, now goes under the names of *Shirwan* and *Eaſt-Georgia*, and is extremely fruitful and pleaſant. The ancient hiſtorians take notice of the Albanian men being tall, ſtrong-bodied, and, generally ſpeaking, of a very graceful appearance; far excelling all other nations in comelineſs as well as ſtature. Modern travellers take no notice of the appearance of the men; but extol the beauty of the women, which ſeems to be unnoticed by the ancients. The Albanians were anciently an independent and pretty powerful people; but we find no mention made of their kings till the reign of Alexander the Great, to whom the king of Albania is ſaid to have preſented a dog of an extraordinary fierceneſs and ſize.—It does not appear that the Albanians

nians were ever conquered by the Romans, even when their power was at its greateſt height; though, when they ventured to engage in war with that powerful empire, they were always defeated, as might naturally be expected.

ALBANO, a town of Italy, on a lake of the ſame name, in the Campagnio of Rome. It was called by the ancients *Albanum Pompeii*, and built out of the ruins of the ancient Alba Longo, which was deſtroyed by Tullus Hoſtilius. It ſtands within twelve miles ſouth-eaſt of Rome, and for the pleaſantneſs of its ſituation is the ſummer retirement of a great many Roman princes. It is likewiſe the ſee of a biſhop, who is one of the ſix ſenior cardinals. The town is famous for its excellent wine, and the ruins of a mauſoleum, which, according to the tradition of the inhabitants, was made for Aſcanius. The proſpect from the garden of the Capuchins is extremely pleaſant, taking in the Campania of Rome, and terminating in a full view of the Tuſcan ſea. Cloſe by the town lies the Alban lake, of an oval figure, and about ſeven miles in circumference, which, by reaſon of the high mountains round it, looks like the area of a great amphitheatre. It abounds with excellent fiſh, and over againſt the hermitage it is ſaid to be unfathomable. The mountain of Albano is called *Monte Cavo*, on the top of which was a celebrated temple dedicated to Jupiter and Juno. Near the Capuchins there is another convent of Franciſcans; and not far from thence the palace of Cardinal Barberini, remarkable for very pleaſant gardens, with the ruins of ancient baths, and ſeveral old fragments of Moſaic work. E. Long. 13. 10. N. Lat. 41. 43.

There is likewiſe another town of the ſame name in the Baſilicate of the kingdom of Naples, remarkable for the fertility of the ſurrounding territory, and for the nobility of the inhabitants.

ALBANS (St), a market-town of Hertfordſhire, is a very great thoroughfare, accommodated with good inns, on the north-weſt road from London, at the diſtance of 21 miles. This town ſends two members to parliament, gives the title of *duke* to the noble family of Beauclerc, and has one of the beſt markets for wheat in England. St Albans is ſeated near the ruins of an ancient Roman city, by Tacitus called *Verolam;* and by the Saxons *Watlingceſter*, becauſe it is ſeated on the road called *Watlingſtreet.* Nothing now remains of Verolam but the ruins of old walls; in the fields adjacent to which they continue to find Roman coins, as they formerly found teſſellated pavements. In memory of St Alban, Offa, king of the Mercians, *anno* 795, erected an abbey, calling it *St Albans;* and near it the town of the ſame name was afterwards built. The church of the abbey is remaining to this day: time and the weather have made it look like ſtone on the outſide; but if you break a bit off, the redneſs of the brick immediately appears. When the monaſteries were diſſolved, the townſmen paid L. 400 to prevent its being levelled with the ground, and have ſince converted it into a pariſh-church, which, for its largeneſs, beauty, and antiquity, claims a particular regard. It had a very noble font of ſolid braſs, in which the children of the kings of Scotland were uſed to be baptized; and was brought from Edinburgh, by Sir Philip Lea, when that city was in flames; but in the times of the late civil wars, it was taken away. Not many years ſince, a tomb was diſcovered in this church, ſaid to be that of Humphry Duke of Glouceſter: when the leaden coffin was opened, the body was pretty entire, being preſerved in a ſort of pickle. There was a ſtately croſs in the middle of the town, as there were in many other places where queen Eleanor's body reſted when it was brought out of the north for interment at Weſtminſter; but it has been demoliſhed, as ſome ſay, by the inhabitants. The market-days are Wedneſdays and Saturdays. W. Long. 0. 12. N. Lat. 51. 44.

ALBANUS MONS (anc. geog.), now called *Mont Albano*, 16 miles from Rome, near where Alba Longa ſtood.

ALBANUS MONS (anc. geog.), to the north of Iſtria, called *Albius* by Strabo; the extremity of the Alps, which, together with the mountains to the eaſt, joining it, called *Montes Bebii*, ſeparates the farther Liburnia and Dalmatia from Pannonia.

ALBANY, a fortreſs belonging to the Britiſh, ſeated on the S. W. of Hudſon's bay. W. Long. 84. 20. N. Lat. 53. 20.

ALBANY, a town of North America, the capital of one of the ten counties of the province of New-York, which goes by the ſame name, is a well-built place, conſidering the country. Here the ſachems, or the kings of the Five Nations of Iroquois, met the governors of the Britiſh plantations, when they entered into any treaty with them. W. Long. 44. 29. N. Lat. 42. 30.

ALBARAZIN, a ſtrong town, and one of the moſt ancient of the kingdom of Arragon in Spain. It is ſeated upon an eminence, near the river Guadelquivir, a little below its ſource, and on the frontiers of Valencia and New Caſtile. It is the ſeat of a biſhop, and produces the beſt wool in all Arragon. It is about 100 miles eaſt of Madrid. E. Long. 2. 10. N. Lat. 40. 32.

ALBARII, in antiquity, properly denoted thoſe who gave the whitening to earthen veſſels, &c. In which ſenſe they ſtood contradiſtinguiſhed from *Dealbatores*, who whitened walls.

ALBARIUM OPUS, in the ancient building, the incruſtation or covering of the roofs of houſes with white plaſter, made of mere lime. This is otherwiſe called *opus album.* It differs from *Tectorium*, which is a common name given to all roofing or ceiling, including even that formed of lime and ſand, or lime and marble; whereas *Albarium* was reſtrained to that made of lime alone.

ALBATI EQUI, an appellation given to ſuch horſes, in the games of the ancient circus, as wore white furniture.

ALBATROSS, in ornithology, a ſpecies of the diomedea. See DIOMEDEA.

ALBAZIN, a town of Greater Tartary, with a ſtrong caſtle. It is ſituated upon the river Amur, or Yamour, and belongs to the Muſcovites. E. Long. 103. 30. N. Lat. 54. 0.

ALBE, a ſmall piece of money, current in Germany, worth only a French ſol and ſeven deniers.

ALBEMARLE, or AUMARLE, a town of France, in Upper Normandy, and in the territory of Caux, from whence the noble family of Keppel takes the title of *Earl.* The ſerges of this town are in high eſteem. It

It is feated on the declivity of a hill, on the confines of Picardy, 35 miles N. E. of Rouen, and 70 N. W. of Paris. E. Long. 2. 21. N. Lat. 49. 50.

ALBEMARLE, the moft northern part of the province of North Carolina in America.

ALBENGUA, a town of Italy, in the territory of Genoa. It is the fee of a bifhop; and is a very ancient handfome town, but not well peopled on account of the infalubrity of the air. However, it is feated in a very beautiful plain, which is well cultivated; and the outfide of the town is furrounded with olive-trees. It is a fea-port, about 38 miles S. W. of Genoa. E. Long. 8. 13. N. Lat. 44. 4.

ALBERNUO, a kind of camblet, brought from the Levant by the way of Marfeilles.

ALBERONI (Julius), the fon of a poor gardener in the fuburbs of Placentia, born in 1664; who, by his great abilities and good fortune, rofe from this low original, to the employment of firft minifter of ftate at the court of Spain, and to the dignity of cardinal. He roufed that kingdom out of the lethargy it had funk into for a century paft; awakened the attention, and raifed the aftonifhment, of all Europe, by his projects; one of which was to fet the Pretender on the throne of Great Britain. He was at length deprived of his employment, and banifhed to Rome. He died in 1752, at the great age of 89. His *Teftament Politique*, collected from his memoirs and letters, was publifhed at Laufanne in 1753.

ALBERT, Margrave of Brandenburg, and the laft grand mafter of the Teutonic Order, laid afide the habit of his order, embraced Lutheranifm, and concluded a peace at Cracow in 1525, by which he was acknowledged Duke of the eaft part of Pruffia (formerly called for that reafon *Ducal Pruffia*), but to be held as a fief of Poland, and to defcend to his male heirs. See PRUSSIA.

ALBERTI (Leone Battifta), was defcended from a noble family in Florence; and was perfectly acquainted with painting, fculpture, and architecture. He wrote of all three in Latin; but his ftudies did not permit him to leave any thing confiderable behind him in painting. He was employed by pope Nicholas V. in his buildings, which he executed in a beautiful manner; and his work on architecture, which confifts of ten books, is greatly efteemed. He alfo wrote fome treatifes of morality, and a piece on arithmetic. He died in 1485.

ALBERTISTS, a fect of fcholaftics, fo named from their leader Albertus Magnus.

ALBERTUS (Magnus), a Dominican friar, and afterwards bifhop of Ratifbon, was one of the moft learned men and moft famous doctors of the 13th century. He is faid to have acted as a man-midwife; and fome have been highly offended that one of his profeffion fhould follow fuch an employment. A book intitled *De Natura Rerum*, of which he was reputed the author, gave rife to this report. In this treatife there are feveral inftructions for midwives, and fo much fkill fhown in their art, that one would think the author could not have arrived at it without having himfelf practifed: but the advocates for Albert fay he was not the writer thereof, nor of that other piece *De Secretis Mulierum;* in which there are many phrafes and expreffions unavoidable on fuch a fubject, which gave great offence, and raifed a clamour againft the fuppofed author. It muft be acknowledged, however, that there are, in his Comment upon the Mafter of Sentences, fome queftions concerning the practice of conjugal duty, in which he has ufed fome words rather too grofs for chafte and delicate ears: but they allege what he himfelf ufed to fay in his own vindication, that he came to the knowledge of fo many monftrous things at confeffion, that it was impoffible to avoid touching upon fuch queftions. Albert was certainly a man of a moft curious and inquifitive turn of mind, which gave rife to other accufations brought againft him. They fay, that he laboured to find out the philofopher's ftone; that he was a magician; and that he made a machine in the fhape of a man, which was an oracle to him, and explained all the difficulties he propofed. He had great knowledge in the mathematics, and by his fkill in that fcience might probably have formed a head with fprings capable of articulate founds; like to the machines of Boetius, of which Caffiodorus has faid, "Metals lowe; the birds of Diomedes trumpet in brafs; the brazen ferpent hiffes; counterfeited fwallows chatter, and fuch as have no proper note, from brafs fend forth harmonious mufic." John Matthæus de Luna, in his treatife *De Rerum Inventoribus*, has attributed the invention of fire-arms to Albert; but in this he is confuted by Naude, in his *Apologie des Grands Hommes*. We are told, that Albert was naturally very dull, and fo incapable of inftruction, as to be upon the point of quitting the cloifter, from defpair of learning what his habit required: but that the Holy Virgin appeared to him, and afked him in which he chofe to excel, philofophy or divinity? that having chofen the former, fhe affured him he fhould become incomparable therein; but that, as a punifhment for not preferring divinity, he fhould fink, before he died, into his former ftupidity. It is added, that after this apparition he had an infinite deal of wit; and that he advanced in all the fciences with fo quick a progrefs, as utterly aftonifhed his mafters: but that, three years before his death, he ftopped fhort when reading a divinity-lecture at Cologn; and having in vain endeavoured to recal his ideas, he found that the Virgin's prediction was accomplifhed. "It would be very unneceffary (fays Bayle, after relating thefe particulars) to obferve that they are fables. Thofe who would believe me need not be told this, fince they would judge in the fame manner of their own accord; and as for fuch as think otherwife, they would not alter their opinion by reading here that I am of a different way of thinking." Albert died at Cologn, November 15. 1280. His works were printed at Lyons, in 1651, in 21 volumes in folio.

ALBERTUS, a gold coin, worth about 14 French livres: it was coined during the adminiftration of Albertus archduke of Auftria.

ALBESIA, in antiquity, a kind of fhields otherwife called *Decumana*. See DECUMANA.

ALBI, a city of France, the capital of the Albigeois, in Languedoc, and the fee of an archbifhop. The cathedral is dedicated to St Cecilia, and has one of the fineft choirs in the kingdom. Here is a very valuable filver fhrine, of exquifite workmanfhip, of the Mofaic kind: it contains the reliques of St Clair, the firft bifhop of this city. The chapel of this pretended

Albi. Albigenses. saint is magnificent, and adorned with paintings. The Lice is a fine large walk without the city: what distinguishes this from all others, is a terras above a deep mall, which serves instead of a fosse; it is bordered with two rows of very fine trees, which are kept in excellent order. There are four gates, through which you may view all the beauties of a delightful plain. At one end of this is the convent of the Dominicans. The archbishop's palace is very beautiful. The river washes its walls, and serves both for an ornament and defence. This city is seated on the river Tarn, 35 miles north-by-west of Toulouse, and 250 south of Paris. E. Long. 0. 52. N. Lat. 43. 56.

The Albigeois is a small territory about 27 miles in length, and 20 in breadth, abounding in corn, woad, grapes, saffron, plums, and sheep; and the inhabitants drive a great trade in dried prunes, grapes, a coarse sort of cloth, and wines of Gaillac. These wines are the only sorts hereabouts that are fit for exportation: they are carried down to Bourdeaux, and generally sold to the British. They have likewise several coal-mines.

ALBIGENSES, in church-history, a sect or party of reformers, about Toulouse and the Albigeois in Languedoc, who sprung up in the 12th century, and distinguished themselves by their opposition to the discipline and ceremonies of the Romish church.

This sect had their name, it is supposed, either by reason there were great numbers of them in the diocese of Albi, or because they were condemned by a council held in that city. In effect, it does not appear that they were known by this name before the holding of that council. The *Albigenses* were also called *Albiani*, *Albigesei*, *Albii*, and *Albanenses*, though some distinguish these last from them. Other names given to them are, *Henricians*, *Abelardists*, *Bulgarians*, &c. some on account of the qualities they assumed; others on that of the country from whence it is pretended they were derived; and others on account of persons of note who adopted their cause, as Peter de Brins, Arnold de Bresse, Abelard, Henry, &c. Berengarius, if not Wickliff himself, is by some ranked in the number. The *Albigenses* are frequently confounded with the *Waldenses*; from whom, however, they differ in many respects, both as being prior to them in point of time, as having their origin in a different country, and as being charged with divers heresies, particularly Manicheism, from which the *Waldenses* are exempt. But several Protestant writers have vindicated them from that imputation. Dr Allix shows, that a great number of *Manichees* did spread over the western countries from Bulgaria; and settled in Italy, Languedoc, and other places, where there were also *Albigenses*; by which means, being both under the imputation of *heresy*, they came, either by ignorance or malice, to be confounded, and called by the same common name, though in reality entirely different.

Other errors imputed to them by their opponents, the monks of those days, were, That they admitted two Christs; one evil, who appeared on earth; the other good, who has not yet appeared: That they denied the resurrection of the body; and maintained human souls to be dæmons imprisoned in our bodies, by way of punishment for their sins: That they condemned all the sacraments of the church; rejected baptism as useless; held the eucharist in abhorrence; excluded the use of confessions and penance; maintained marriage unlawful; laughed at purgatory, prayers for the dead, images, crucifixes, &c.—There were likewise said to be two classes of them: the Perfect, and the Believers. The perfect boasted of their living in continence, of eating neither flesh, eggs, nor cheese. The believers lived like other men, and were even loose in their morals; but they were persuaded they should be saved by the faith of the perfect, and that none were damned who received imposition of hands from them. But from these charges also they are generally acquitted by Protestants; who consider them as the pious inventions of the Romish church, whose members deem it meritorious by any means to blacken heretics.

However this be, the Albigenses grew so formidable, that the Catholics agreed upon a holy league or croisade against them. They were at first supported by Raimond, count of Toulouse. Pope Innocent III. desirous to put a stop to their progress, sent a legate into their country; which failing, he stirred up Philip Augustus, king of France, and the other princes and great men of the kingdom, to make war upon them. Upon this the count of Toulouse, who had sided with them, made his submission to the pope, and went over to the Catholics: but soon after, finding himself plundered by the croisaders, he declared war against them, and was joined by the king of Arragon. His army was defeated at the siege of Muret, where he himself was killed, and the defeat followed by the surrender of the city of Toulouse, and the conquest of the greatest part of Languedoc and Provence. His son Raimond succeeded him; who agreed with the king and the pope to set up the inquisition in his estates, and to extirpate the Albigenses. In an assembly held at Milan, the archbishop of Toulouse drew up articles; agreeable to which the count made a most ample declaration against them, which he published at Toulouse in 1253. From this time the Albigenses dwindled by little and little, till the times of the reformation; when such of them as were left fell in with the Vaudois, and became conformable to the doctrine of Zuinglius and the disciples of Geneva.

ALBIGENSES is also a name sometimes given to the followers of Peter Vaud, or Waldo; and hence synonymous with what we more properly call *Waldenses*, or Poor Men of Lyons. In this sense the word is applied by Camerarius, Thuanus, and several other writers. The reason seems to be, that the two parties agreed in their opposition to the papal innovations and incroachments, though in divers other respects said to be different enough. The bishop of Meaux labours hard to support a distinction between the two sects, alleging that the *Albigenses* were heretics and Manichees; whereas the *Waldenses* were only schismatics, not heretics; being sound as to articles of faith, and only separating from the church of Rome on account of forms and discipline. Dr Allix endeavours to set aside the distinction; and shows, that both of them hold the same opinions, and were equally condemned and held for heretics: and this not for points of faith, but for declaiming against the papal tyranny and idolatry, and holding the pope to be the Antichrist; which last, according to M. de Meaux, constitutes nothing less than

Manicheifm. In this fenfe the Lollards and Wickliffites in England were not only Albigenfes but Manichees.

ALBINTEMELIUM, Albintimilium, (Tacitus;) or at full length, Albium Intemelium, (Pliny, Strabo); now *Vintimiglia*, fituated in the fouthweft of the territory of Genoa, near the borders of the county of Nice, with a port on the Mediterranean, at the mouth of the rivulet Rotta, almoft about half-way between Monaco and S. Remo. E. Long. 7. 40. Lat. 43. 17.

ALBIOECE, or Alebece, (Pliny, Strabo); otherwife called *Reii Apollinares*, from their fuperftitious worfhip of Apollo; alfo *Civitas Reienfium;* now *Riez*, in Provence, about 18 leagues to the north-eaft of Toulon, on the north fide of the rivulet Verdon; was originally a Roman colony, (Infcription.) It is fometimes written *Regium.* The people were called *Albici*, (Cæfar.) E. Long. 1. 0. Lat. 43. 20.

ALBINI, in antiquity, the workmen employed in what was called *Opus Albarium.* They make a different profeffion from the *dealbatores* or *whiteners.*

ALBINOS, the name by which the Portuguefe call the white Moors, who are looked upon by the negroes as monfters. They at a diftance might be taken for Europeans; but, when you come near them, their white colour appears like that of perfons affected with a leprofy.

In Saussure's *Voyages dans les Alpes*, is the following account of two boys, at Chamouni, who have been called *Albinos.* "The elder, who was at the end of the year 1785 about twenty, or one-and-twenty years of age, had a dull look, with lips fomewhat thick, but nothing elfe in his features to diftinguifh him from other people. The other, who is two years younger, is rather a more agreeable figure: he is gay and fprightly, and feems not to want wit. But their eyes are not blue; the iris is of a very diftinct rofe-colour: the pupil too, when viewed in the light, feems decidedly red; which feems to demonftrate, that the interior membranes are deprived of the uvea, and of that black mucous matter that fhould line them. Their hair, their eye-brows, and eye-lafhes, the down upon their fkin, were all, in their infancy, of the moft perfect milk-white colour, and very fine; but their hair is now of a reddifh caft, and has grown pretty ftrong. Their fight too is fomewhat ftrengthened; though they exaggerate to ftrangers their averfion for the light, and half-fhut the eye-lids, to give themfelves a more extraordinary appearance. But thofe who, like me, have feen them in their infancy, before they were tutored to this deceit, and when too few people came to Chamouni to make this affectation profitable to them, can atteft that then they were not very much offended with the light of day. At that time, they were fo little defirous of exciting the curiofity of ftrangers, that they hid themfelves to avoid fuch; and it was neceffary to do a fort of violence to them before they could be prevailed on to allow themfelves to be infpected. It is alfo well known at Chamouni, that when they were of a proper age they were unable to tend the cattle like the other children at the fame age; and that one of their uncles maintained them out of charity, at a time of life when others were capable of gaining a fubfiftence by their labour.

"I am therefore of opinion, that we may confider thefe two lads as true albinos: for if they have not the thick lips and flat nofes of the white negroes, it is becaufe they are albinos of Europe, not of Africa. This infirmity affects the eyes, the complexion, and the colour of the hair; it even diminifhes the ftrength, but does not alter the conformation of the features. Befides, there are certainly in this malady various degrees: fome may have lefs ftrength, and be lefs able to endure the light: but thefe circumftances in thofe of Chamouni are marked with characters fufficiently ftrong to intitle them to the unhappy advantage of being claffed with that variety of the human fpecies denominated albinos.

"When nature prefents the fame appearance often, and with circumftances varied, we may at laft difcover fome general law, or fome relation which that appearance has with known caufes: but when a fact is fo fingular and fo rare, as that of thofe albinos, it gives but little fcope to conjectures; and it is very difficult to verify thofe by which we attempt to explain it.

"I at firft imagined that this difeafe might be referred to a particular fort of organic debility; that a relaxation of the lymphatic veffels within the eye might fuffer the globules of the blood to enter too abundantly into the iris, the uvea, and even into the retina, which might occafion the rednefs of the iris and of the pupil. The fame debility feemed alfo to account for the intolerance of the light, and for the whitenefs of the hair.

"But a learned phyfiologift, M. Blumenbach, profeffor in the univerfity at Gottingen, who has made many profound obfervations on the organs of fight, and has confidered with great attention the albinos of Chamouni, attributes their infirmity to a different caufe.

"The ftudy of comparative anatomy has furnifhed him with frequent opportunities of obferving this phenomenon; he has found it in brutes, in white dogs, and in owls; he fays, it is generally to be feen in the warm-blooded animals; but that he has never met with it in thofe with cold blood.

"From his obfervations, he is of opinion, that the rednefs of the iris, and of the other internal parts of the eye, as well as the extreme fenfibility that accompanies this rednefs, is owing to the total privation of that brown or blackifh mucus, that, about the fifth week after conception, covers all the interior parts of the eye in its found ftate. He obferves, that Simon Pontius, in his treatife *de Coloribus Oculorum*, long ago remarked, that in blue eyes the interior membranes were lefs abundantly provided with this black mucus, and were therefore more fenfible to the action of light. This fenfibility of blue eyes agrees very well, fays M. Blumenbach, with northern people, during their long twilight; while, on the contrary, the deep black in the eyes of negroes enables them to fupport the fplendor of the fun's beam in the torrid zone.

"As to the connection between this red colour of the eyes and the whitenefs of the fkin and hair, the fame learned phyfiologift fays, that it is owing to a fimilarity of ftructure, *confenfus ex fimilitudene fabricæ.* He afferts, that this black mucus is formed only in the delicate cellular fubftance, which has numerous blood-veffels contiguous to it, but contains no fat; like the infide of the eye, the fkin of negroes, the fpotted palate of feveral domeftic animals, &c. And, laftly, he

fays,

Albinos. ſays, that the colour of the hair generally correſponds with that of the iris *Gazette litt. de Gotingue*, Oct. 1784.

"At the very time that M. Blumenbach was reading this memoir to the Royal Society of Gottingen, M. Buzzi, ſurgeon to the hoſpital at Milan, an eleve of the celebrated anatomiſt *Moſcati*, publiſhed, in the *Opuſcoli Scelti de Milan*, 1784, t. vii. p. 11. a very intereſting memoir, in which he demonſtrates by diſſection what Blumenbach had only ſuppoſed.

"A peaſant of about 30 years of age died at the hoſpital of Milan of a pulmonary diſorder. His body, being expoſed to view, was exceedingly remarkable by the uncommon whiteneſs of the ſkin, of the hair, of the beard, and of all the other covered parts of the body. M. Buzzi, who had long deſired an opportunity of diſſecting ſuch a ſubject, immediately ſeized upon this. He found the iris of the eyes perfectly white, and the pupil of a roſe-colour. The eyes were diſſected with the greateſt poſſible care, and were found entirely deſtitute of that black membrane which anatomiſts call the *uvea;* it was not to be ſeen either behind the iris, or under the retina: within the eye there was only found the choroid coat extremely thin and tinged, of a pale red colour, by veſſels filled with diſcoloured blood. What was more extraordinary, the ſkin, when detached from different parts of the body, ſeemed alſo entirely diveſted of the *rete mucoſum:* maceration did not diſcover the leaſt veſtige of this, not even in the wrinkles of the abdomen, where it is moſt abundant and moſt viſible.

"M. Buzzi likewiſe accounts for the whiteneſs of the ſkin and of the hair, from the abſence of the *rete mucoſum*, which, according to him, gives the colour to the cuticle, and to the hairs that are ſcattered over it. Among other proofs of this opinion, he alleges a well-known fact, that if the ſkin of the blackeſt horſe be accidentally deſtroyed in any part of the body, the hairs that afterwards grow on that part are always white, becauſe the *rete mucoſum* which tinges thoſe hairs is never regenerated with the ſkin.

"The proximate cauſe of the whiteneſs of albinos, and the colour of their eyes, ſeems therefore pretty evidently to depend on the abſence of the *rete mucoſum:* But what is the remote cauſe?

"In the firſt place, it ſeems probable that men affected with this infirmity form no diſtinct ſpecies, for they are produced from parents that have dark ſkins and black eyes. What is it then that deſtroys the *rete mucoſum* in ſuch perſons? M. Buzzi relates a ſingular fact, which ſeems to throw ſome light on this ſubject.

"A woman of Milan, named Calcagni, had ſeven ſons. The two eldeſt had brown hair and black eyes; the three next had white ſkins, white hair, and red eyes: the two laſt reſembled the two eldeſt. It was ſaid that this woman, during the three pregnancies that produced the albinos, had a continual and immoderate appetite for milk, which ſhe took in great quantities: but that when ſhe was with child of the other four children, ſhe had no ſuch deſire. It is not however aſcertained, that this preternatural appetite was not itſelf the effect of a certain heat, or internal diſeaſe, which deſtroyed the *rete mucoſum* in the children before they were born.

"The albinos of Chamouni are alſo the offſpring of parents with dark ſkins and black eyes. They have three ſiſters by the ſame father and mother, who are alſo brunettes. One of them that I ſaw had the eyes of a dark brown, and the hair almoſt black. They are ſaid, however, to be all afflicted with a weakneſs of ſight. When the lads are married, it will be curious to obſerve how the eyes of their children will be formed. The experiment would be particularly deciſive if they were married to women like themſelves. But this faulty conformation ſeems to be more rare among women than among men; for the four of Milan, the two of Chamouni, the one deſcribed by Mauperitus, the one by Helvetius, and almoſt all the inſtances of theſe ſingular productions, have been of our ſex. It is known, however, that there are races of men and women affected with this diſeaſe, and that theſe races perpetuate themſelves, in Guinea, in Java, at Panama, &c.

"Upon the whole, this degeneration does not ſeem to be owing to the air of the mountains; for though I have traverſed the greateſt part of the Alps, and the other mountains of Europe, theſe are the only individuals of the kind that ever I met with."

Albinovanus, Albinus.

ALBINOVANUS, a Latin poet, whom Ovid ſurnamed the *Divine*. There is now nothing of his extant, except an Elegy on Druſus, and another on the Death of Mecænas.

ALBINUS (Bernhard Siegfred), a celebrated phyſician and anatomiſt, was born, of an illuſtrious family, at Francfort on the Oder in 1697. His father was then profeſſor of the practice of medicine in the univerſity of Francfort; but in the year 1702 he repaired to Leyden, being nominated profeſſor of anatomy and ſurgery in that univerſity. Here his ſon had an opportunity of ſtudying under the moſt eminent maſters in Europe, who, from the ſingular abilities which he then diſplayed, had no difficulty in prognoſticating his future eminence. But while he was diſtinguiſhed in every branch of literature, his attention was particularly turned to anatomy and ſurgery. His peculiar attachment to theſe branches of knowledge gained him the intimate friendſhip of Ruyſch and Rau, who at that time flouriſhed in Leyden; and the latter, ſo juſtly celebrated as a lithotomiſt, is ſaid to have ſeldom performed a capital operation without inviting him to be preſent. Having finiſhed his ſtudies at Leyden, he went to Paris, where he attended the lectures of Du-Verney, Vaillant, and other celebrated profeſſors. But he had ſcarce ſpent a year there, when he was invited by the curators of the univerſity of Leyden, to be a lecturer in anatomy and ſurgery at that place. Though contrary to his own inclination, he complied with their requeſt, and upon that occaſion was created Dr of phyſic without any examination. Soon after, upon the death of his father, he was appointed to ſucceed him as profeſſor of anatomy; and upon being admitted into that office on the 9th of November 1721, he delivered an oration, *De vera via ad fabricæ humani corporis cognitionem ducente;* which was heard with univerſal approbation. In the capacity of a profeſſor, he not only beſtowed the greateſt attention upon the inſtruction of the youth entruſted to his care, but in the improvement of the medical art. With this view, he publiſhed many important diſcoveries of his own; and by elegant editions, turned the attention of phyſicians to works of merit, which might otherwiſe have been neglected.

neglected. By these means his fame was soon extended over Europe; and the societies of London, Petersburgh, and Harlem, cheerfully received him as an associate. In 1745, he was appointed professor of the practice of medicine at Leyden, and was succeeded in the anatomical chair by his brother Frid. Bern. Albinus. He was twice rector of the university, and as often he refused that high honour when it was voluntarily offered him. At length, worn out by long service and intense study, he died on the 9th of September 1770, in the 74th year of his age.

ALBION, the ancient name of BRITAIN.

New Albion, a name given by Sir Francis Drake to California.

ALBIREO, (in Astronomy) a star of the third or fourth magnitude, in the constellation CYGNUS.

ALBIS, (in anc. geog.) now the Elbe, which divided ancient Germany in the middle, and was the boundary of the ancient geography of Germany, so far as that country was known to the Romans: all beyond they owned to be uncertain, no Roman except Drusus and Tiberius having penetrated so far as the Elbe. In the year of the building of the city 744, or about six years before Christ, Domitius Ahenobarbus, crossing the river with a few, merited the ornaments of a triumph; so glorious was it reckoned at Rome to have attempted the passage. In the following age, however, the river that before occupied the middle of ancient Germany, became its boundary to the north, from the irruptions of the Sarmatæ, who possessed themselves of the Transalbin Germany. The Elbe rises in the borders of Silesia, out of the Risenberg, runs through Bohemia, Misnia, Upper Saxony, Anhalt, Magdeburg, Brandenburg, Danneberg, Lauenburg, Holstein, and after being swelled by many other rivers, and passing by Hamburg and Gluckstadt, falls into the German, or North sea, to both which places the river is navigable by large vessels.

ALBISOLA, a small town belonging to the republic of Genoa: here is a porcelain manufacture, and several country-houses of the Genoese nobility. It was bombarded in 1745 by the English. E. Long. 8. 20. N. Lat. 44. 15.

ALBOGALERUS, in Roman antiquity, a white cap worn by the *flamen dialis*, on the top of which was an ornament of olive branches.

ALBORAK, amongst the Mahometan writers, the beast on which Mahomet rode in his journeys to heaven. The Arab commentators give many fables concerning this extraordinary vehicle. It is represented as of an intermediate shape and size between an ass and a mule. A place, it seems, was secured for it in paradise at the intercession of Mahomet; which, however, was in some measure extorted from the prophet, by Alborak's refusing to let him mount him when the angel Gabriel was come to conduct him to heaven.

ALBORO, in zoology, a name by which the erythrinus, a small red fish, caught in the Mediterranean, is commonly known in the markets of Rome and Venice.

ALBOURG, a town of Denmark, in North Jutland, capital of the diocese of the same name, and a bishop's see. It has this name, which signifies *eel-town*, on account of the great number of eels taken here. It is seated on a canal, 10 miles from the sea, 30 north of Wiburgh, and 50 north of Arhuys. It has an exchange for merchants, and a safe and deep harbour. They have a considerable trade in herrings and corn; and a manufactory of guns, pistols, saddles, and gloves. E. Long. 29. 16. N. Lat. 56. 35.

ALBRICIUS, born at London, was a great philosopher, a learned and able physician, and well versed in all the branches of polite literature. He lived in the 11th century, and wrote several works in Latin, particularly, 1. Of the origin of the gods. 2. The virtues of the ancients. 3. The nature of poison, &c.

ALBUCA, BASTARD STAR-OF-BETHLEHEM: A genus of the monogynia order, belonging to the hexandria class of plants; and in the natural method ranking under the 10th order, *Coronariæ*. The characters are: The *calyx* is wanting: The *corolla* consists of six oval oblong petals, which are persistent: The *stamina* consist of six three-sided filaments the length of the corolla: Of these, three are fertile, with versatile antheræ; three are barren, without antheræ: The *pistillum* has an oblong three-sided germen; the stylus is three-sided: The *pericarpium* is an oblong obtuse triangular capsule, having three cells and three valves: The *seeds* are numerous, flat, and incumbent. Of this genus Linnæus reckons only two

Species. 1. The major, or star-flower, with spear-shaped leaves. This is a native of Canada, and some other parts of North America: the root is bulbous; from whence shoot up eight or ten long, narrow, spear-shaped leaves. In the centre of these arises a flower-stem, a foot or more in height, garnished with a loose spike of greenish yellow flowers. After the flowers are past, the germen swells to a three-cornered capsule, having three cells filled with flat seeds. 2. The minor, or African star-flower, is a native of the Cape of Good Hope. This hath also a pretty large bulbous root, from which arise four or five narrow awl-shaped leaves, of a deep green colour; the flower-stem, which comes from the center of the root, is naked, and rarely rises more than eight or nine inches high, having five or six greenish-yellow flowers, growing almost in the form of an umbel at top: these are rarely succeeded by seeds in Britain.

Culture. The Canada albuca is hardy; so the roots may be planted about four inches deep in a border of light earth, where they will thrive and produce their flowers late in the summer: but as the seeds do not often ripen in Britain, and the bulbs put out few offsets, the plants are not common in this country. The African sort generally flowers twice a-year; first in March or April, and again in July or August; and if its roots are kept in pots filled with light earth, sheltered under a hot-bed frame, they will flower even in winter; but the best method is to have a border in the front of a green-house, or stove, where the roots of most of the bulbous flowers may be planted in the full ground, and screened in winter from frost: in such situations they thrive much better, and flower stronger, than when kept in pots.

ALBUGINEA TUNICA, in anatomy, the third or innermost coat or covering of the testes; it is likewise the name given to one of the coats of the eye.

ALBUGINEUS, in anatomy, a term sometimes applied to the aqueous humour of the eye.

ALBUGO, or LEUCOMA, in medicine, a distemper occasioned

occafioned by a white opaque fpot growing on the *cornea* of the eye, and obftructing vifion. See MEDICINE (Index).

ALBUM, in antiquity, a kind of white table, or regifter, wherein the names of certain magiftrates, public tranfactions, &c. were entered. Of thefe there were various forts; as the *album decurionum, album fenatorum, album judicum, album prætoris*, &c.

ALBUM Decurionum, was the regifter wherein the names of the *decuriones* were entered. This is otherwife called *matriculatio decurionum.*

ALBUM Senatorum, the lift of fenators names, which was firft introduced by Auguftus, and renewed yearly.

ALBUM Judicum, that wherein the names of the perfons of thofe *decuriæ* who judged at certain times, were entered.

ALBUM Prætoris, that wherein the *formulæ* of all actions, and the names of fuch judges as the prætor had chofen to decide caufes, were written.

The high-prieft entered the chief tranfactions of each year into an *album*, or table, which was hung up in his houfe for the public ufe.

ALBUM is alfo ufed, in later times, to denote a kind of table, or pocket-book, wherein the men of letters with whom a perfon has converfed, infcribe their names with fome fentence or motto. —The famous Algernon Sydney being in Denmark, was by the univerfity of Copenhagen prefented with their *album*, whereupon he wrote thefe words:

—— ——Manus hæc inimica tyrannis
Enfe petit placidam fub libertate quietem.

ALBUM Græcum, among phyficians, the white dung of dogs, formerly prefcribed for inflammations of the throat, &c. but now juftly defpifed.

ALBUMAZAR, a learned Arabian aftronomer in the tenth century, who wrote a treatife, *Of the Revolution of the Years.*

ALBUMEN, the white of an egg. For its nature, origin, and office, fee EGG.

The white of an egg, according to Boerhaave, makes an extraordinary menftruum. Being boiled hard in the fhell, and afterwards fufpended in the air by a thread, it refolves and drops down into an infipid, fcentlefs, liquor, which appears to be that anomalous unaccountable menftruum fo much ufed by Paracelfus; and will, though it contain nothing fharp, oleaginous, or faponaceous, make a thorough folution of myrrh; which is more than either water, oil, fpirits, or even fire itfelf, can effect.

A little putrid white of egg taken into the ftomach, occafions a naufea, horror, fainting, vomiting, diarrhœa, and gripes; it inflames the bile, excites heat, thirft, fever; and diffolves the humours like the plague. On the contrary, the white of frefh-laid eggs, if taken while warm from the hen, is extremely nourifhing to the infirm: it may be taken in luke-warm milk; but if any other heat is applied to it, the nutritious quality will be deftroyed. The frefh white of egg prevents burns from rifing in blifters, if it is ufed immediately after the accident: it mitigates inflammations of the eyes, and preferves the face from fun-burning. In pharmacy, it is ufed as a medium to render balfams and turpentines, &c. mifcible with aqueous fluids; but as it difagrees with many ftomachs when thus taken, a mucilage of gum arabic may fupply its place, it being as good a medium in fimilar circumftances, and not apt to offend the tendereft ftomach.—Whites of eggs are alfo ufeful for clarifying liquors; to which purpofe, being mixed and incorporated with the liquors to be clarified, and the whole afterwards boiled, the whites of eggs are by this means brought together and hardened, and thus carry off the grofs parts of the liquor along with them.

ALBUQUERQUE, a fmall city in Spain, in the province of Eftremadura, is feated on an eminence, nine miles from the frontiers of Portugal. It is commanded by an almoft impregnable fortrefs, built on a high mountain, and ferving to defend the town. It carries on a great trade in wool and woollen manufactures. It was taken by the allies of Charles king of Spain, in 1705. W. Long. 7. 0. N. Lat. 38. 52.

ALBURN, the Englifh name of a compound colour, being a mixture of white and red, or reddifh brown. Skinner derives the word, in this fenfe, from the Latin *albus*, and the Italian *burno*, from *bruno*, brown.

ALBURNUM, the foft white fubftance which in trees is found between the liber or inner bark and the wood, and in progrefs of time acquiring folidity, becomes itfelf the wood. From its colour and comparative foftnefs, it has been ftyled by fome writers the fat of trees, *adeps arborum.*

The alburnum is found in largeft quantities in trees that are vigorous; though in fuch as languifh, or are fickly, there is a great number of beds. In an oak fix inches in diameter, this fubftance is nearly equal in bulk to the wood. In a trunk of one foot diameter, it is as one to three and a half; of two and a half feet diameter, as one to four and a half, &c. but thefe proportions vary according to the health and conftitution of the trees.—The alburnum is frequently gnawed in pieces by infects, which lodge in the fubftance, and are nourifhed from it.

ALBURNUS, in zoology, a fpecies of the *cyprinus* of Linnæus. See CYPRINUS.

ALCA, or AUK, in ornithology, a genus of the order of anferes. The beak of this genus is without teeth, fhort, convex, compreffed, and frequently furrowed tranfverfely; the inferior mandible is gibbous near the bafe; the feet have generally three toes. The fpecies of the alca are 12; of which the moft remarkable are,

1. The impennis, northern penguin, or great auk, with a compreffed bill furrowed on each fide, and an oval fpot on each fide of the eyes. According to Mr Martin, this bird breeds on the ifle of St Kilda; appearing there the beginning of May, and retiring the middle of June. It lays one egg, which is fix inches long, of a white colour; fome are irregularly marked with purplifh lines croffing each other, others blotched with black, and ferruginous about the thicker end: if the egg is taken away, it will not lay another that feafon. Mr Macaulay informs us that it does not vifit that ifland annually, but fometimes keeps away for feveral years together; and adds, that it lays its egg clofe to the fea-mark, being incapable, by reafon of the fhortnefs of its wings, to mount higher. The length of this bird, to the end of its toes, is three feet: but its wings are fo fmall, as to be ufelefs for flight; the length, from the tip of the longeft quill-feathers to the

Alca.

the firſt joint, being only four inches and a quarter. This bird is obſerved by ſeamen never to wander beyond foundings; and according to its appearance they direct their meaſures, being then aſſured that land is not very remote. It ſometimes frequents the coaſts of Norway, the Ferroe iſles, Iceland, Greenland, and Newfoundland; and feeds much on the lump-fiſh, father-laſher, and other fiſh of that ſize. The young birds eat roſe-root, and other plants. The old ones are very rarely ſeen on ſhore, tho' the young ones are not unfrequently met with. It is a very ſhy bird. It walks ill; but dives well, and is taken in the manner uſed for the razor-bill and puffin. The ſkin between the jaws is blown into a bladder, and uſed for the darts of the Greenlanders, as is alſo that of ſome other birds. The ſkin of the body is ſuppoſed to be uſed by the Eſquimaux Indians for garments.

2. The alle, little auk, or black and white diver, with a ſmooth conical bill, a white ſtreak on the belly and wings, and black feet. The bulk of this ſpecies exceeds not that of a black-bird. It is not very common in Britain, being only met with now and then. It ſeems to be moſt plentiful towards the north, being met with in various parts as far as Spitzbergen. It is common in Greenland, in company with the black-billed ſpecies; feeds on the ſame food; and lays two blueiſh white eggs, larger than thoſe of a pigeon. It flies quick, and dives well; and is always dipping its bill into the water while ſwimming or at reſt on the water. It grows fat in the ſtormy ſeaſon, from the waves bringing plenty of crabs and ſmall fiſh within its reach; but from its ſize it is leſs ſought after than the others In Greenland it is called the *Ice-bird*, being the harbinger of ice. This ſpecies is ſometimes ſeen of a pure white.

3. The arctica, or puffin, with a compreſſed bill and four furrows; the orbit of the eyes and temples are white. The legs of this ſpecies are very ſmall; and placed ſo far behind as to diſqualify it from ſtanding, except quite erect, reſting not only on the foot, but the whole length of the leg. This circumſtance* makes the riſe of the puffin from the ground very difficult, and it meets with many falls before it gets on wing; but when that is effected, few birds fly longer or ſtronger. Theſe birds frequent the coaſts of ſeveral parts of Great Britain and Ireland; but no place in greater numbers than Prieſtholm iſle, where their flocks may be compared to ſwarms of bees for multitude. Theſe are birds of paſſage; they reſort there annually about the fifth or tenth of April, quit the place (almoſt to a bird), and return twice or thrice before they ſettle to burrow and prepare for ovation and incubation. They begin to burrow the firſt week in May; but ſome few ſave themſelves that trouble, and diſlodge the rabbits from their holes, taking poſſeſſion of them till their departure from the iſle. Thoſe which form their own burrows, are at that time ſo intent on the work as to ſuffer themſelves to be taken by the hand. This taſk falls chiefly to the ſhare of the males; who alſo aſſiſt in incubation. The firſt young are hatched the beginning of July. The old ones ſhow vaſt affection towards them; and ſeem totally inſenſible of danger in the breeding ſeaſon. If a parent is taken at that time, and ſuſpended by the wings, it will in a ſort of deſpair treat itſelf moſt cruelly, by biting every part it can reach; and the moment it is looſed, will never offer to eſcape, but inſtantly reſort to its unfledged young: this affection ceaſes at the ſtated time of migration, which is moſt punctally about the 11th of Auguſt, when they leave ſuch young as cannot fly to the mercy of the peregrine falcon, who watches the mouths of the houſe for the appearance of the little deſerted puffins, which, forced by hunger, are compelled to leave their burrows. They lay only one egg. The eggs differ much in form: ſome have one end very acute; others have both extremely obtuſe; all are white. Their fleſh is exceſſively rank, as they feed on ſea-weeds and fiſh, eſpecially ſprats: but when pickled and preſerved with ſpices, are admired by thoſe who love high-eating. Dr Caius tells, that, in his days, the church allowed them in lent, inſtead of fiſh: he alſo acquaints us, that they were taken by means of ferrets, as we take rabbits: at preſent, they are either dug out, or drawn from their burrows by a hooked ſtick: they bite extremely hard; and keep ſuch faſt hold on whatever they faſten, as not to be eaſily diſengaged. Their noiſe, when taken, is very diſagreeable; being like the efforts of a dumb perſon to ſpeak. Theſe birds are alſo common in Ireland; on the iſland Sherries, three leagues N. N. W. of Holyhead; and in the S. Stack, near Holyhead, they breed in plenty. They inhabit Iceland and Greenland; and breed in the extreme part of the iſlands. It is alſo found in the Ferroe iſles, where it is called *Lunda;* and in the Farn iſles, where it is called *Coulter-neb*, from the ſhape of the bill. It goes alſo by various other names; ſuch as *Gulden-head*, *Bottle-noſe*, and *Helegug*, in Wales; at Scarborough, *Mullet;* and in Cornwall, *Pope*. In America they are ſaid to frequent Carolina in winter; and have been met with in Sandwich Sound by our late voyagers: the natives ornament the fore parts and collar of their ſeal-ſkin jackets with the beaks of them; and thoſe of Aoonalaſhka wear gowns of their ſkins, along with thoſe of other birds. On the coaſt of Kamtſchatka and the Kurulſchi iſlands they are common, even on the Penſchinſki bay, almoſt as far as Ochotka: the nations of the two firſt wear the bills about their necks faſtened to ſtraps; and, according to the ſuperſtition of theſe people, their ſhaman or prieſt muſt put them on with a proper ceremony, in order to procure good fortune.

* It attends every one of the genus.

4. The torda, or razor-bill, with four furrows on the bill, and a white line on each ſide running from the bill to the eyes. Theſe birds, in company with the guillemot, appear in our ſeas the beginning of February; but do not ſettle on their breeding places till they begin to lay, about the beginning of May. They inhabit the ledges of the higheſt rocks that impend over the ſea, where they form a groteſque appearance; ſitting cloſe together, and in rows one above another. They properly lay but one egg a-piece, of an extraordinary ſize for the bulk of the bird, being three inches long: it is either white, or of a pale ſea-green, irregularly ſpotted with black: if this egg is deſtroyed, both the auk and the guillemot will lay another; if that is taken, then a third: they make no neſt, depoſiting their egg on the bare rock; and though ſuch multitudes lay contiguous, by a wonderful inſtinct each diſtinguiſhes its own. What is alſo matter of great amazement, they fix their egg on the ſmooth rock, with ſo exact a balance, as to ſecure it from rolling off; yet ſhould

ſhould it be removed, and then attempted to be replaced by the human hand, it is extremely difficult, if not impoſſible, to find its former equilibrium. According to Mr Latham, it is by means of a cement that the bird fixed its egg. The eggs are food to the inhabitants of the coaſts they frequent; which they get with great hazard; being lowered from above by ropes, truſting to the ſtrength of their companions, whoſe footing is often ſo unſtable that they are forced down the precipice, and periſh together. Theſe birds are found in the north of Europe, alſo in Iceland, Greenland, and on the coaſt of Labrador. In Europe they extend along the White Sea into the Arctic Aſiatic ſhores, and from thence to Kamtſchatka and the gulph of Ochotka: It is the only one which reaches the inland Baltic; being found there on the Carls-Ozar iſles, near Gothland, and the iſle of Bondon off Angermania.

5. The pica, or black-billed auk, has the bill of the ſame form with the torda, but is entirely black. The cheeks, chin, and throat, are white: in all other reſpects it agrees with the former ſpecies. Mr Latham is of opinion that it is no other than the young of that ſpecies. Mr Pennant obſerves, that it is ſometimes found on our coaſts; but, according to Mr Latham, it is in the winter-ſeaſon only, when the common ſort has quitted them. They are ſaid to be met with on the coaſt of Candia and other parts of the Mediterranean; "where, no doubt (Mr Latham obſerves) the complete old bird is likewiſe found, as I have been informed that they are common in the bay of Gibraltar, where it is curious to ſee their activity under water when purſuing the fiſh; for, as the water in the bay is ſometimes clear for a great depth from the ſurface, theſe birds may be often ſeen as it were flying after their prey, with all the agility of a bird in the air, turning in every direction after the fiſh, with ſuch wonderful addreſs and dexterity as ſeldom to miſs their aim."

6. The cirrhata of Dr Pallas, or tufted auk, ſomewhat bigger than the common puffin, and the colours much the ſame: the bill is an inch and three-quarters in length, the ſame in depth at the baſe, and croſſed with three furrows: over each eye ariſes a tuft of feathers four inches in length, which falls elegantly on each ſide of the neck, reaching almoſt to the back; and are white as far as they are attached to the head, but afterwards of a fine buff yellow: the legs are of a bright red; the claws black. The female is principally diſtinguiſhed by having the bill croſſed only with two furrows inſtead of three. This ſpecies inhabits the ſhores of Kamtſchatka, the Kurile iſlands, and thoſe intervening between Kamtſchatka and America. In manners it greatly reſembles the puffin; living all day at ſea, but at no great diſtance from the rocks; it comes on ſhore at night; burrows a yard deep under ground, and makes a neſt, with feathers and ſea-plants; is monogamous, and lodges there the whole night with its mate. It lays one white egg, the end of May or beginning of June, which alone is thought fit to be eaten, the fleſh of the bird itſelf being inſipid and hard. It feeds on crabs, ſhrimps, and ſhell-fiſh, which laſt it forces from the rocks with its ſtrong bill. Pallas remarks, that the Kamtſchatkan girls imitate the tufts of theſe birds, which nature has ſupplied them with, by placing a ſimilar ſtrip of the white ſkin of the glutton behind each ear, hanging down behind by way of ornament; and is a well-received preſent from a lover to his miſtreſs. The bills both of this and the common puffin were formerly held by the natives as a charm, and worn by the prieſts as amulets; indeed at the preſent theſe have been ſeen fixed round their head-dreſſes, but ſuppoſed now to be only eſteemed as mere ornaments: the ſkins are however made uſe of for clothing, being ſewed together. It is called in Kamtſchatka, *Muechagatka;* and in Oſchotka, *Igilma.*

7. The pſittacula, or perroquet auk, of Dr Pallas, is about the ſize of the little auk. The bill is much compreſſed on the ſides, in ſhape convex both above and below, and of a bright red colour: from the remote corner of each eye is a very ſlender tuſt of fine white feathers, hanging down the neck: the head and upper part of the body are duſky; the lower whitiſh, varied with black edges: the legs are of a dirty yellow; and the webs duſky. This ſpecies is found at Kamtſchatka, in the iſles towards Japan, and on the weſtern ſhores of America. They are ſometimes ſeen in flocks, but ſeldom far from land, except driven by ſtorms. Of nights they harbour in the crevices of rocks. They lay an egg almoſt the ſize of a hen's, of a dirty white or yellowiſh colour ſpotted with brown; which they do about the middle of June, upon the bare rock or ſand, for they make no neſt. Like moſt of the tribe, they are ſtupid birds, as may be evinced by the ridiculous method of catching them:—One of the natives places himſelf under a looſe garment of fur, of a particular make, with large open ſleeves, among the rocks, at evening; when the birds, returning to their lodging-places at duſk, run under the ſkirts, and up the arm-holes, for ſhelter during the night; and thus become an eaſy prey. Their ſtupidity likewiſe occaſions them to fly aboard a ſhip at ſuch times, miſtaking it for a rooſting-place; whereby navigators have been taught to avoid the danger of falling in too near with land, either of evenings, or on approaching ſtorms. The eggs are eſteemed good.

ALCÆUS, a famous ancient lyric poet, born at Mitylene, in the iſland of Leſbos. Horace ſeems to think him the inventor of this kind of poeſy:

> Now the Roman muſe inſpire,
> And warm the ſong with Grecian fire. *Francis.*

He flouriſhed in the 44th Olympiad, at the ſame time with Sappho, who was likewiſe of Mitylene. Alcæus was a great enemy to tyrants, but not a very brave ſoldier. He was preſent at an engagement, wherein the Athenians gained a victory over the Leſbians; and here, as he himſelf is ſaid to have confeſſed in one of his pieces, he threw down his arms, and ſaved himſelf by flight. Horace, who, of all the Latin poets, moſt reſembled Alcæus, has made the like confeſſion:

> With thee I ſaw Philippi's plain,
> Its fatal rout, a fearful ſcene!
> And dropp'd, alas! th' inglorious ſhield,
> Where valour's ſelf was forc'd to yield;
> Where ſoil'd in duſt the vanquiſh'd lay,
> And breath'd th' indignant ſoul away. *Francis.*

The poetical abilities of Alcæus are indiſputed; and though

though his writings were chiefly in the lyric ſtrain, yet his muſe was capable of treating the ſublimeſt ſubjects with a ſuitable dignity. Hence Horace ſays,

Alcæus ſtrikes the golden ſtrings,
And ſeas, and war, and exile, ſings.
Thus while they ſtrike the various lyre,
The ghoſts the ſacred ſounds admire:
But when Alcæus lifts the ſtrain
To deeds of war and tyrants ſlain,
In thicker crowds the ſhadowy throng
Drink deeper down the martial ſong. *Francis.*

Alcæus, an Athenian tragic poet, and, as ſome think, the firſt compoſer of tragedies. He renounced his native country Mitylene, and paſſed for an Athenian. He left ten pieces, one of which was Paſiphaë, that which he produced when he diſputed with Ariſtophanes, in the fourth year of the 97th Olympiad.

There is another Alcæus mentioned in Plutarch, perhaps the ſame whom Porphyrius mentions as a compoſer of ſatirical iambics and epigrams, and who wrote a poem concerning the plagiariſm of Euphorus the hiſtorian. He lived in the 145th Olympiad.

We are told likewiſe of one Alcæus, a Meſſenian, who lived in the reign of Veſpaſian and Titus. We know not which of theſe it was who ſuffered for his lewdneſs a very ſingular kind of death, which gave occaſion to the following epitaph:

Ἀλκαιυ ταφος ϛτ&c., &c.

This is Alcæus's tomb; who died by a radiſh,
The daughter of the earth, and puniſher of Adulterers.

This puniſhment inflicted on adulterers, was thruſting one of the largeſt radiſhes up the anus of the adulterer: or, for want of radiſhes, they made uſe of a fiſh with a very large head, which Juvenal alludes to:

Quoſdam mœchos et mugilis intrat. *Sat.* x.
The mullet enters ſome behind.

Hence we may underſtand the menace of Catullus,

Ah! tum te miſerum, maliquæ fati,
Quem attractis pedibus, patente porta,
Percurrent raphanique magileſque. *Epig.* xv.
Ah! wretched thou, and born to luckleſs fate,
Who art diſcover'd by the unſhut gate!
If once, alas! the jealous huſband come,
The radiſh or the ſea-fiſh is thy doom.

ALCAICS, in ancient poetry, a denomination given to ſeveral kinds of verſe, from Alcæus, their inventor.

The firſt kind conſiſts of five feet, viz. a ſpondee, or iambic; an iambic; a long ſyllable; a dactyle; another dactyle: ſuch is the following verſe of Horace,

Omnes | eodem cogimur, | omnium
Verſa|tur ur|nâ | ſerius | ocyus |
Sors exitura.

The ſecond kind conſiſts of two dactyles and two trochees: as,

Exili|um impoſi|tura | cymbæ.

Beſides theſe two, which are called *dactylic Alcaïcs*, there is another ſtyled ſimply *Alcaïc;* conſiſting of an epitrite; a choriambus; another choriambus; and a bacchius: the following is of this ſpecies,

Cur timet fla|vum Tiberim tan|gere, cur | olivum?

Alcaic Ode, a kind of manly ode compoſed of ſeveral ſtrophes, each conſiſting of four verſes; the two firſt of which are always Alcaics of the firſt kind; the third verſe is a diameter hypercatalectic, or conſiſting of four feet and a long ſyllable; and the fourth verſe is an Alcaïc of the ſecond kind. The following ſtrophe is of this ſpecies, which Horace calls *minaces Alcæi camenæ.*

Non poſſidentem multa vocaveris
Recte beatum: rectius occupat
Nomen beati, qui deorum
Muneribus ſapienter uti, &c.

ALCAID, Alcayde, or Alcalde, in the polity of the Moors, Spaniards, and Portugueſe, a magiſtrate, or officer of juſtice, anſwering nearly to the French provoſt and the Britiſh juſtice-of-peace.—The alcaid among the Moors is veſted with ſupreme juriſdiction, both in civil and criminal caſes.

ALCALA de Guadeira, a ſmall town of Spain, in Andaluſia, upon the river Guadeira. Here are abundance of ſprings, from whence they convey water to Seville by an aqueduct. W. long. 6. 16. N. lat. 37. 15.

Alcala de Henares, a beautiful and large city of Spain, in New Caſtile, ſeated upon the river Henares, which waſhes its walls. It is built in a very agreeable plain, and is of an oval figure. The ſtreets are handſome and pretty ſtraight; one of them is very long, running from one end of the city to the other. The houſes are well built; and there are ſeveral ſquares, the largeſt of which is an ornament to the city; it is ſurrounded on all ſides with piazzas, where tradeſmen have their ſhops, to expoſe ſeveral ſorts of commodities to ſale, of which there is as great plenty and variety as in moſt towns of Spain. The univerſity was founded by cardinal Ximenes, archbiſhop of Toledo, about the beginning of the 16th century. The land about Alcala is watered by the Henares, well cultivated, and very fruitful, while that at a diſtance is dry and ſterile: it yields grain in plenty, very good muſcat wine, and melons of a delicious kind. Without the walls is a ſpring, the water of which is ſo pure and ſo well taſted, that it is incloſed and ſhut up for the king of Spain's own uſe, from whence it is carried to Madrid.—This city is 10 miles ſouth-weſt of Guadalaxara, and 13 miles eaſt of Madrid. W. long. 4. 20. N. lat. 40. 30.

Alcala-Real, a ſmall city of Spain, in Andaluſia, with a fine abbey. It is built on the top of a high mountain, in a mountainous country; and the road to it is incommodious, rough, and unequal; but to make amends for this, here are ſeveral kinds of exquiſite fruit and wine. W. Long. 4. 15. N. Lat. 37. 18.

ALCALY, or Alcali, or Alkali. See Chemistry, *Index*.

ALCANIS, a town of Arragon in Spain, ſeated on the river Gaudaloup, twelve miles from Caſpe. It was formerly the capital of the kingdom of the Moors; but being taken from them, it was made a commandery of the order of Calatrava. Here is a very remarkable fountain, which throws up water through 42 pipes. It is ſurrounded with gardens and fruit-trees, and defended with a good fortreſs. W. Long. 0. 5. N. Lat. 41. 0.

ALCANNA, in commerce, a powder prepared from the

the leaves of the Egyptian privet, in which the people of Cairo drive a considerable trade. It is much used by the Turkish women to give a golden colour to their nails and hair. In dyeing, it gives a yellow colour when steeped with common water, and a red one when infused in vinegar. There is also an oil extracted from the berries of alcanna, and used in medicine as a calmer.

ALCANTARA, a small, but very strong city of Estremadura, in Spain. It gives name to one of the three orders of knighthood. It is seated on the banks of the Tajo, or Tagus, 21 miles from Coria, in a very fruitful soil, and is celebrated for its bridge over that river. This was built in the time of the emperor Trajan, as appears by an inscription over one of the arches, by the people of Lusitania, who were assessed to supply the expence. It is raised 200 feet above the level of the water; and though it consists but of six arches, is 670 feet in length, and 28 in breadth. At the entrance of the bridge, there is a small antique chapel hewn in a rock by the ancient Pagans, who dedicated it to Trajan, as the Christians did to St Julian. This city was built by the Moors, on account of the convenience of this bridge; which is at a place where the Tajo is very deep, running between two high steep rocks: for this reason, they called it *Al-Cantara*, which, in their language, signifies *the Bridge*. It was taken from them in 1214, and given to the knights of *Calatrava*, who afterwards assumed the name of *Alcantara*. It was taken by the Earl of Galloway, in April, 1706, and retaken by the French in November following. It is 45 miles from Madrid, and 125 from Seville. W. Long. 7. 12. N. Lat. 39. 30.

Knights of ALCANTARA, a military order of Spain, which took its name from the above-mentioned city. They make a very considerable figure in the history of the expeditions against the Moors. The knights of Alcantara make the same vows as those of Calatrava, and are only distinguished from them by this, that the cross fleur de lys, which they bear over a large white cloak, is of a green colour. They possess 37 commanderies. By the terms of the surrender of Alcantara to this order, it was stipulated, that there should be a confraternity between the two orders, with the same practices and observances in both; and that the order of Alcantara should be subject to be visited by the grand-master of Calatrava. But the former soon released themselves from this engagement, on pretence that their grand-master had not been called to the election of that of Calatrava, as had been likewise stipulated in the articles. After the expulsion of the Moors, and the taking of Granada, the sovereignty of the order of Alcantara and that of Calatrava was settled in the crown of Castile by Ferdinand and Isabella.—In 1540, the knights of Alcantara sued for leave to marry, which was granted them.

ALCAREZ, a small city of La Mancha, in Spain, defended by a pretty strong castle, and remarkable for an ancient aqueduct. It stands near the river Guardamena, and the soil about it is very fruitful. They have a breed of little running-horses, which are very fleet and strong. It is 25 miles north of the confines of Andalusia, 108 south of Cuenza, and 138 south-by-east of Madrid. W. Long. 1. 50. N. Lat. 38. 28.

ALCASSAR DO SAL, a town of Portugal, in Estremadura, which has a castle said to be impregnable. It is indeed very strong, both by art and nature, being built on the top of a rock which is exceedingly steep on all sides. Here is a salt-work which produces very fine white salt, from whence the town takes its name. The fields produce large quantities of a sort of rushes, of which they make mats, which are transported out of the kingdom. W. Long. 9. 10. N. Lat. 38. 18.

ALCASSAR, a city of Barbary, seated about two leagues from Larache, in Asga, a province of the kingdom of Fez. It was of great note, and the seat of the governor of this part of the kingdom. It was built by Jacob Almanzor, king of Fez, about the year 1180, and designed for a magazine and place of rendezvous for the great preparations he was making to enter Granada in Spain, and to make good the footing Joseph Almanzor had got some time before. It is said his father first invaded Spain with 300,000 men, most of whom he was obliged to bring back to Africa to quiet a rebellion that had broke out in Morocco. This done, he returned to Spain again with an army, as is said, of 200,000 horse and 300,000 foot. The city is now fallen greatly to decay, so that of fifteen mosques there are only two that they make use of. The reason, probably, is the bad situation of the town; for it stands so low, that it is excessively hot in summer, and almost overflowed with water in the winter. This they affirm to be owing to a curse of one of their saints. Here are a great number of storks, who live very familiarly with the people, walking about the town, possessing the tops of the houses and mosques without molestation; for they esteem them sacred birds, and account it sinful to disturb them. At present, the bashaw of Tetuan appoints a governor to this town, which is the last of his dominions towards Mequinez. Near this city there is a high ridge of mountains, running towards Tetuan, whose inhabitants were never brought entirely under subjection; and whenever it was attempted, they revenged themselves by infesting the roads, and robbing and destroying the travellers. When they were pursued, they retired into their woody mountains, where none could safely follow them. Not far from hence is the river Elmahassen, famous for the battle fought between Don Sebastian king of Portugal and the Moors; in which the Portuguese were defeated and their king slain. W. Long. 12, 35. N. Lat. 35. 15.

ALCAVALA, in the Spanish finances, was at first a tax of ten per cent. afterwards of fourteen per cent. and is at present of only six per cent. upon the sale of every sort of property, whether moveable or immoveable; and it is repeated every time the property is sold. The levying of this tax requires a multitude of revenue-officers sufficient to guard the transportation of goods, not only from one province to another, but from one shop to another. It subjects not only the dealers in some sorts of goods, but those in all sorts, every farmer, every manufacturer, every merchant and shopkeeper, to the continual visits and examination of the tax-gatherers. Through the greater part of a country in which a tax of this kind is established, nothing can be produced for distant sale. The produce of every part of the country must be proportioned to the consumption of the neighbourhood. It is to the Alcavala, accordingly, that Ustaritz imputes the ruin of the manufactures of Spain. He might have imputed

ted to it likewife the declenfion of agriculture, it being impofed not only upon manufactures, but upon the rude produce of the land.

ALCAZAR LEGUER, a town of Africa, in the kingdom of Fez, and in the province of Ilabat. It was taken by Alphonfo, king of Portugal, in 1468; but foon after that, it was abandoned to the Moors. It is feated on the coaft of the ftraits of Gibraltar. W. Long. 5. 30. N. Lat. 38. 0.

ALCAZER, a town of Spain, in New Caftile, feated on the river Guardamana, which has a fortrefs on a high hill for its defence, and lies in a very fruitful country. It is 100 miles north-weft of Carthagena. W. Long. 2. 10. N. Lat. 38. 15.

ALCE, ALCES, or ELK, in zoology, the trivial name of a fpecies of the cervus, belonging to the order of mammalia pecora. See CERVUS.

ALCEA, the HOLLY-HOCK: A genus of the polyandria order, belonging to the monodelphia clafs of plants; and in the natural method ranking under the 37th order, *Columniferæ*. The characters are: The *calyx* is a double perianthium, monophyllous and perfiftent; the exterior one fix-cleft, the interior half five-cleft: The *corolla* confifts of five petals, coalefced at the bafe, heart-fhaped inverfely, and expanding: The *ftamina* confift of numerous filaments, coalefced below into a five-cornered cylinder, loofe above, and inferted into the corolla; the antheræ are kidney-fhaped: The *piftillum* has a roundifh germen; a fhort cylindric ftylus; and numerous briftly ftigmata the length of the ftylus: The *pericarpium* confifts of many arilli, jointed into a verticillum about a columnar depreffed receptacle: The *feeds* are folitary, reniform, and depreffed.

Species. Although Linnæus mentions two diftinct fpecies of this genus, viz. the *rofea* and *ficifolia*, he thinks, that the latter may perhaps be only a variety of the former; but Mr Miller affirms them to be diftinct fpecies, whofe difference in the form of their leaves always continues. The leaves of the firft fort are roundifh, and cut at their extremities into angles; thofe of the fecond are deeply cut into fix or feven fegments, fo as to refemble a hand. Cultivation produces almoft an infinite variety of this plant, fuch as double-flowered, fingle-flowered, deep red, pale red, blackifh red, white, purple, yellow, and flefh-colour. The firft fpecies is a native of China, the fecond grows alfo in Iftria. Tho' natives of warm countries, they are hardy enough to thrive in the open air in Britain, and have for many years been fome of the greateft ornaments in gardens, towards the end of fummer; but they have the inconvenience of growing too large for fmall gardens, and requiring tall ftakes to fecure them from being broken by ftrong winds. In large gardens, however, when properly difpofed, they make a fine appearance; for as their fpikes of flowers grow very tall, there will be a fucceffion of them on the fame ftems more than two months: the flowers on the lower part of the fpike appear in July; and as their ftalks advance, new flowers are produced till near the end of September. When planted in good ground, the ftalks will often rife to the height of eight or nine feet; fo that near fix feet of each will be garnifhed with flowers, which, when double and of good colours, make a very beautiful appearance.

Culture. The holly-hock is propogated by feeds, which fhould be carefully faved from thofe plants whofe flowers are double and of the beft colours: for though the duplicity of the flowers, as well as their colour, are only accidental properties, yet the young plants will produce nearly the fame kind of flowers with thofe from which the feeds are taken, provided no plants with fingle or bad-coloured flowers are permitted to grow near them; and as foon as fuch appear they ought to be removed from the good ones, that their farina may not fpread into the others, which would caufe them to degenerate. The feeds ought to be gathered very dry, and remain in their capfules until fpring; but care muft be taken that no wet comes to them in winter, otherwife the covers would turn mouldy, and fpoil their contents.—They fhould be fown in drills, about the middle of April, on a bed of light earth, and covered with earth of the fame kind about half an inch deep. When the plants have put out fix or eight leaves, they fhould be tranfplanted into nurfery-beds, obferving to water them until they have taken good root; after which they will require no farther care, but to keep them clean from weeds till October, when they fhould be tranfplanted where they are to remain.

ALCEDO, or KINGSFISHER, in ornithology, a genus of the order of picæ. The alcedo has a long, ftrait, thick, triangular bill; with a flefhy, plain, fhort, flat tongue.

Of this genus there are a great many fpecies, with one or other of which almoft every part of the world is furnifhed. Moft of them frequent rivers, and live on fifh, the fingularity of catching which is admirable: fometimes hovering over the water, where a fhoal of fmall fifhes is feen playing near the furface; at other times waiting with attention, on fome low branch hanging over the water, for the approach of a fingle one who is fo unlucky as to fwim that way; in either cafe dropping like a ftone, or rather darting with rapidity on his prey; when, feizing it croffwife in his bill, it retires to a refting place to feaft on it; which it does piecemeal, bones and all, without referve, afterwards bringing up the indegiftible parts in pellets, like birds of prey. The wings of moft of the genus are very fhort; yet the birds fly rapidly, and with great ftrength. It may be remarked, that throughout this genus, blue, in different fhades, is the moft predominant colour.—The fpecies found in the South Sea Iflands are held in a kind of fuperftitious veneration by the natives of the places they feverally inhabit, perhaps on account of their being frequently feen flying about the morais or burial-places. That which inhabits Otaheite, where it is called *Erooro*, is accounted particularly facred, and not allowed to be taken or killed.

1. The ifpida, or common kingsfifher, is not much larger than a fwallow; its fhape is clumfy; the bill difproportionably long; it is two inches from the bafe to the tip; the upper chap black, and the lower yellow. But the colours of this bird attone for its inelegant form: the crown of the head and the coverts of the wings are of a deep blackifh green, fpotted with bright azure: the back and tail are of the moft refplendent azure; the whole under-fide of the body is orange-coloured; a broad mark of the fame paffes from the bill beyond the eyes; beyond that is a large white fpot; the tail is fhort, and confifts of twelve feathers of a rich deep blue;

Alcedo.

blue; the feet are of a reddiſh yellow, and the three joints of the outmoſt toe adhere to the middle toe, while the inner toe adheres only by one.

From the diminutive ſize, the ſlender ſhort legs, and the beautiful colours of this bird, no perſon would be led to ſuppoſe it one of the moſt rapacious little animals that ſkims the deep. Yet it is for ever on the wing, and feeds on fiſh; which it takes in ſurpriſing quantities, when we conſider its ſize and figure. It takes its prey after the manner of the oſprey, balancing itſelf at a certain diſtance above the water for a conſiderable ſpace, then darting into the deep, and ſeizing the fiſh with inevitable certainty. While it remains ſuſpended in the air, in a bright day, the plumage exhibits a beautiful variety of the moſt dazzling and brilliant colours. This ſtriking attitude did not eſcape the notice of the ancients; for Ibycus, as quoted by Athenæus, ſtyles theſe birds αλκυονες τανυσιπτεροι, the halcyons with expanded wings. It makes its neſt in holes in the ſides of the cliffs, which it ſcoops to the depth of three feet; and lays from five to nine eggs, of a moſt beautiful ſemi-tranſparent white. The female begins to lay early in the ſeaſon, and excludes her firſt brood about the beginning of April. The male, whoſe fidelity exceeds even that of the turtle, brings her large proviſions of fiſh while ſhe is thus employed; and ſhe, contrary to moſt other birds, is found plump and fat at that ſeaſon. The male, that uſed to twitter before this, now enters the neſt as quietly and as privately as poſſible. The young ones are hatched at the expiration of 20 days; but are ſeen to differ as well in their ſize as in their beauty.

This ſpecies is the αλκυωναφωνος, or mute halcyon of Ariſtotle, which he deſcribes with more preciſion than is uſual with that great philoſopher. After his deſcription of the bird follows that of its neſt; than which the moſt inventive of the ancients have delivered nothing that appears at firſt ſight more fabulous and extravagant. He relates, that it reſembled thoſe concretions that are formed by the ſea-water; that it reſembled the long-necked gourd; that it was hollow within; that the entrance was very narrow, ſo that, ſhould it overſet, the water could not enter; that it reſiſted any violence from iron, but could be broke with a blow from the hand; and that it was compoſed of the bones of the Βελονη, or ſea-needle. The neſt had medical virtues aſcribed to it; and from the bird was called *Halcyoneum*. In a fabulous age, every odd ſubſtance that was flung aſhore received that name; a ſpecies of tubular coral, a ſponge, a zoophite, and a miſcellaneous concrete, having by the ancients been dignified with that title from their imaginary origin*. Yet much of this ſeems to be founded on truth. The form of the neſt is juſtly deſcribed; and the materials which Ariſtotle ſays it was compoſed of, are not entirely of his own invention. Whoever has ſeen the neſt of the kingsfiſher, will obſerve it ſtrewed with the bones and ſcales of fiſh; the fragments of the food of the owner and its young.— On the foundation laid by the philoſopher, ſucceeding writers formed other tales extremely abſurd; and the poets, indulging the powers of imagination, dreſſed the ſtory in all the robes of romance. This neſt was a floating one:

Incubat *halcyone* pendentibus æquore nidis.
Ovid. Met. lib. xi.

It was therefore neceſſary to place it in a tranquil ſea, and to ſupply the bird with charms to allay the fury of a turbulent element during the time of its incubation; for it had, at that ſeaſon, power over the ſeas and the winds.

Χ' αλκυνος ςορησευντι τα κυματα, την τε θαλασσαν,
Τον τε νοτον, τον τ' ευρον, ος εσχατα φυκια κινει'
Α'λκυονης, γλαυκαις Νηρησι ται τε μαλιςα
Ορνιθων εφιλαθεν. Theocrit. Idyl. vii. l. 57.

May *Halcyons* ſmooth the waves, and calm the ſeas,
And the rough ſouth-eaſt ſink into a breeze;
Halcyons, of all the birds that haunt the main,
Moſt lov'd and honour'd by the *Nereid* train.
Fawkes.

Theſe birds were equally favourites with Thetis as with the Nereids;

Dilectæ *Thetidi* Halcyones. Virg. Georg. I. 399.

as if to their influence theſe deities owed a repoſe in the midſt of the ſtorms of winter, and by their means were ſecured from thoſe winds that diſturb their ſubmarine retreats, and agitated even the plants at the bottom of the ocean.

Such are the accounts given by the Roman and Sicilian poets. Ariſtotle and Pliny tells us, that this bird is moſt common in the ſeas of Sicily: that it ſat only a few days, and thoſe in the depth of winter; and during that period the mariner might ſail in full ſecurity; for which reaſon they were ſtyled *Halcyon days*.

Perque dies placidos hiberno tempore ſeptem
Incubat *Halcyone* pendentibus æquore nidis:
Tum via tuta maris: ventos cuſtodit, et arcet
Æolus egreſſu. Ovid. *Met.* lib. xi.
Alcyone, compreſs'd,
Seven days ſits brooding on her watery neſt,
A wintry queen; her ſire at length is kind,
Calms every ſtorm, and huſhes every wind.
Dryden.

In after-times, theſe words expreſſed any ſeaſon of proſperity: theſe were the *Halcyon days* of the poets; the brief tranquillity, the *ſeptem placidi dies*, of human life.

The poets alſo made it a bird of ſong. Virgil ſeems to place it in the ſame rank with the linnet;

Littoraque *Halyconem* reſonant, et *Acanthida* dumi.
Georg. III. 338.

And Silius Italicus celebrates its muſic, and its floating neſt:

Cum ſonat *Halcyone* cantu, nidoſque natantes
Immota geſtat ſopitis fluctibus unda. *Lib.* xiv. 275.

But theſe writers ſeem to have transferred to our ſpecies, the harmony that belongs to the *vocal alcedo**; one of the loſt birds of the ancients.

As the ancients have had their fables concerning this bird, ſo have the modern vulgar. It is an opinion generally received among them, that the fleſh of the kingsfiſher will not corrupt, and that it will even baniſh all vermin. This has no better foundation than that which is ſaid of its always pointing, when hung up dead, with its breaſt to the north. The only truth which can be affirmed of this bird when killed is, that its

* Plin. lib. xxxii. c. 8. Dioſc lib. v. c. 94.

* Ariſt. Hiſt. an. 892.

its fleſh is utterly unfit to be eaten; while its beautiful plumage preſerves its luſtre longer than that of any other bird we know.

This bird is found not only in Britain, but throughout Europe, Aſia, and Africa; as ſpecimens have been received from both China, Bengal, and Egypt. Belon alſo remarks his having met with it in Romania and Greece; and Scopoli notices it as a bird of Carniola, where he ſays it remains the whole year as in England. Indeed it bears the rigours of the colder climates ſo well, that among the Germans it has gained the name of *Eiſzvogel*, or *Ice Bird:* Olina ſpeaks alſo of its not regarding the ice and cold; and Gmelin aſſures us, that it is found even in Tartary and Siberia. But, however this may be, there are few winters in which many of theſe birds do not periſh, apparently from cold alone; as ſeveral have been found frozen ſtiff by the ſides of even running water, without the leaſt mark of violence about them. M. D'Aubenton has kept theſe birds for ſeveral months, by means of ſmall fiſh put into baſons of water, on which they have fed; for on experiment they have refuſed all other kinds of nouriſhment.

2. The rudis, or Egyptian kingsfiſher, as deſcribed by Haſſelquiſt, is the ſize of the Royſton crow. The bill is blackiſh, more than half an inch broad at the baſe, and two inches in length: the head, ſhoulders, and back, are brown, marked with oblong ferruginous ſpots: the throat is of a ferruginous white: the belly and thighs are whitiſh, marked with longitudinal broadiſh cinereous ſpots: upper tail coverts are quite white: the quills ſpotted with white on the inner webs, chiefly at the tips: the tail is aſh-coloured: the legs are of a pale green; and the claws blackiſh. It inhabits lower Egypt, about Cairo; builds in ſycamore and date trees; and feeds on frogs, inſects, and ſmall fiſh, which laſt it meets with in the fields when they are overflowed. Its cry is not unlike that of the common crow.

3. Le taparara of Buffon is about the ſize of a ſtarling. The upper mandible of the bill is black, the lower red: the hind part of the neck, the back, and ſcapulars, are of an elegant blue; the rump and upper tail coverts bright beryl-blue: the under parts of the body are white; the wing coverts blue; and the legs red. Inhabits Cayenne and Guiana, at which laſt place the natives call all the kingsfiſher tribe by the name *Taparara.* In this part of South America, which contains many rivers full of fiſh, kingsfiſhers, as might be expected, abound in vaſt numbers: but what is remarkable, they never herd together, always being found ſingle, except in breeding-time, which is about the month of September. They lay their eggs in the holes of banks, like the kingsfiſher of Europe. The cry of this bird imitates the word *Carac.*

4. The torquata, or cinereous kingsfiſher, is about the ſize of a magpie, and fifteen inches and a half in length. The bill is three inches and a half long, and brown; the baſe of the lower mandible reddiſh: the head is creſted: the upper parts of the head and body are blueiſh aſh; the under parts cheſtnut: the throat is whitiſh, deſcending down the neck, and paſſing behind like a collar, ending towards the back in a point: the under tail coverts are of a pale fulvous, tranſverſely ſtriated with black: leſſer wing coverts varied with blueiſh, aſh, black, and yellowiſh: the legs are red; and the claws blackiſh. It inhabits Martinico and Mexico; at which laſt it is called *Achalalactli.* This bird migrates into the northern parts of Mexico at certain ſeaſons only, and is ſuppoſed to come there from ſome hotter parts.

[The jacamars are much allied to this genus, and have been ranked under it by Linnæus: Their toes are, however, differently placed; their food alſo is different, being inſects alone, and not fiſh; and their haunts are different, being moiſt woods, and not ſhores or the banks of rivers.]

5. The galbula, or green jacamar, is about the ſize of a lark. The bill is black, of a ſquare form, a little incurvated and ſharp at the point: the plumage in general, in the upper part of the body, is of a moſt brilliant green, gloſſed with copper and gold in different lights: the belly, throat, and vent, are rufous: the tail is compoſed of ten feathers, and ſhaped like a wedge: the legs are of a greeniſh yellow, very ſhort and weak; the claws are black. This ſpecies is found both in Guiana and Braſil, in the moiſt woods, which it prefers to the more dry ſpots, for the ſake of inſects, on which it feeds. It is ſeldom ſeen except ſingle, as it is a very ſolitary bird, keeping for the moſt part in the thickeſt parts; its flight quick, but ſhort; perches on branches of a middling height, where it ſits all night, and frequently part of the day, without ſtirring. Though theſe birds are ſolitary, yet they are far from ſcarce, as many may be met with. They are ſaid to have a ſhort and agreeable note. The natives of Guiana call this bird *Venetore*, and the Creoles, *Colibri des grands bois*. At Braſil their fleſh is eaten by ſome.

6. The paradiſea, or paradiſe jacamar, is of the ſame ſize with the former, and has a ſimilar bill: the throat, fore part of the neck, and under wing coverts, are white: the reſt of the plumage is of a deep dull green, in ſome lights appearing almoſt black, in others with a ſlight gloſs of violet and copper bronze: the tail is compoſed of twelve feathers of unequal lengths: the two middle ones longeſt: the legs are black: the toes are placed two before and two behind, and pretty much united. It inhabits Surinam; and like the others, it feeds on inſects; and ſometimes, contrary to them, frequents open places. It flies farther at a time, and perches on the tops of trees: It is frequently found with a companion, not being quite ſo ſolitary a bird as the other. It alſo differs in the note, having a kind of ſoft whiſtle often repeated, but not heard a great way off.

Above 30 other ſpecies have been deſcribed by ornithologiſts.

ALCHEMILLA, or LADIES-MANTLE: A genus of the monogynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking under the 35th order *Senticoſæ.* The *calyx* is a ſingle-leav'd perianthium, tubular, and perſiſtent; the mouth flat, and eight-parted: There is no *corolla.* The *ſtamina* conſiſt of four ſmall erect ſubulated filaments placed in the mouth of the calyx; the antheræ are roundiſh: The *piſtillum* has an egg-ſhaped *germen:* The *ſtylus* is filiform, the length of the ſtamina, and inſerted at the baſe of the germ: The ſtigma is globular. There is no *pericarpium*, but the neck of the calyx cloſed. The *ſeed* ſolitary, elliptical, and compreſſed. Of this genus there are three

Species. 1. The vulgaris, or common ladies-mantle, with leaves plaited like a fan, and yellowish-green blossoms. It grows naturally in pasture-lands in this as well as in most other countries in Europe. The leaves discover to the taste a moderate astringency; and were formerly much esteemed in some female weaknesses, and in fluxes of the belly. They are now rarely made use of, tho' both the leaves and roots might doubtless be of service in cases where mild astringents are required. In the province of Smolandia in Gothland, they make a tincture of the leaves, and give it in spasmodic or convulsive diseases. Horses, sheep, and goats, eat it; cows are not fond of it; swine refuse it.—2. The alpina, or cinque-foil ladies-mantle, with finger-shaped sawed leaves, and greenish blossoms. It is a native of the mountainous parts of Europe. Goats and cows eat it; horses, sheep, and swine, refuse it.—3. The minor, or least ladies-mantle, with five smooth leaves growing at a joint and cut into many segments. It grows naturally in Sweden, Lapland, and other cold countries. Eaten by cows and goats; refused by horses, sheep, and swine.

Culture. These plants have perennial roots, and annual stalks. They are easily propagated by parting of their roots, or sowing their seeds in autumn. They should have a moist soil and shady situation, and be kept clean from weeds; which is all the culture they require.

ALCHEMIST, a practitioner in alchemy.

ALCHEMY, that branch of chemistry which had for its principal objects the transmutation of metals into gold; the panacea, or universal remedy; an alkahest, or universal menstruum; an universal ferment; and many other things equally ridiculous.

Kircher, instructed in all the secrets of chemistry, has fully exposed the artifices and impostures of alchemists. An alchemist puts into a crucible the matter which is to be converted into gold; this he sets on the fire, blows it, stirs it with rods; and, after divers operations, gold is found at the bottom of the crucible, instead of the matter first put in: this there are a thousand ways of effecting, without any transmutation. Sometimes it is done by dexterously dropping in a piece of gold concealed between the fingers, sometimes by casting in a little of the dust of gold or silver disguised under the appearance of some elixir, or other indifferent matter; sometimes a crucible is used which has a double bottom, and gold put between the two; sometimes the rod used to stir the matter is hollow, and filled with the dust of the metal desired; at other times there is metal mixed with the charcoal, the ashes of the furnace, or the like. Mr Harris very properly distinguishes from alchemy and chemistry; and defines the former to be *ars sine arte, cujus principum est mentiri, medium laborare, et finis mendicare;* and the Italians have a proverb, *non ti fidiare al alchemista povero o medico amalato.* The ruin which has attended this delusion has occasioned several states to make severe laws against pretences to alchemy. The Romans formerly banished all such as professed it; and the sacred canons likewise directed the thunder of their censure against them. Dioclesian and Cæsar directed all books which treated of this subject to be burnt. Rymer furnishes us with a licence for practising alchemy, with all kinds of metals and minerals, granted to one Richard Carter in the 1476; *Rym. Fœd.* tom. xii. Nevertheless, we have had severe laws against alchemy, and multiplying of metals, as much so as against coining itself.

ALCIAT (Andrew), a great lawyer, who flourished in the 16th century, born at Milan. He mixed much of polite learning in the explication of the laws, and happily drove out the barbarity of language which till then had reigned in the lectures and writings of lawyers; for which Thuanus highly praises him. He published a great many law-books, and some notes upon Tacitus. His Emblems have been much admired, and translated into French, Italian, and Spanish; and several learned men have written commentaries on them.

ALCIBIADES, an Athenian general. It was the fate of this great man to live at a time when his country was a scene of confusion. The Greeks, grown insolent from their conquests in Persia, turned their army against each other, and bandied together under the conduct of the two most opulent states Athens and Lacedæmon. Alcibiades, in the midst of an expedition he had planned against the enemy of his country, was recalled home to answer some charge of a private nature; but fearing the violence of his enemy, instead of going to Athens, he offered his services at Sparta, where they were readily accepted. By his advice the Lacedæmonians made a league with Persia, which gave a very favourable turn to their affairs. But his credit in the republic raising jealousies against him, he privately reconciled himself to his country, and took again the command of an Athenian army. Here victory, waiting as it were at his command, attended all his motions. The loss of seven battles obliged the Spartans to sue for peace. He enjoyed his triumphs, however, only a short time at Athens. One unsuccessful event made him again obnoxious to the malice of his citizens; and he found it expedient to retire from Athens. In his absence the Spartans again took the lead, and at the fatal battle of Ægos entirely subdued the Athenian power. Alcibiades, though an exile, endeavoured to restore the power of his country; of which the Spartans having intelligence, procured him to be assassinated. He was a man of admirable accomplishments, but indifferently principled; of great parts; and of an amazing versatility of genius.

ALCINOUS, king of the Phænicians, in the island now called *Corfu*, was son of Nausithous, and grandson of Neptune and Peribea. It is by his gardens this king has chiefly immortalized his memory. He received Ulysses with much civility, when a storm had cast him on his coast. The people here loved pleasure and good cheer, yet were skilful seamen; and Alcinous was a good prince.

ALCMAER, a city of the United Provinces, seated in North Holland, about four miles from the sea, 15 from Haerlem, and 18 from Amsterdam. It is a handsome city, and one of the cleanest in Holland. The streets and houses are extremely neat and regular, and the public buildings very beautiful. It had formerly two parish-churches, dedicated to St Matthew and St Lawrence. The latter had so high a tower, that it served for a sea-mark to the vessels that were in the open sea; but, in 1464, it tumbled down, and damaged the other church so much, that they were both

both demolished in 1470, and one church was built in their stead, dedicated to the same saints. The Spaniards, under the command of Frederic of Toledo, son of the duke d'Alva, came to besiege it, after they had taken Haerlem in 1573; but were forced to raise the siege, after three months lying before it, as well on account of the infection of the air as the stout resistance of the inhabitants and soldiers; even the women signalizing themselves bravely in its defence. It is recorded in the register of this city, that, in the year 1637, 120 tulips, with the off-sets, sold for 90,000 florins. The town has a very good trade in butter and cheese, of which a vast quantity is sold every year, and is esteemed the best in Holland. E. long. 4. 26. N. lat. 52. 28.

ALCMAN, a lyric poet, who flourished in the 27th Olympiad. He was born at Sparta; and composed several poems, of which only some fragments are remaining, quoted by Athenæus and some other ancient writers. He was very amorous; accounted the father of gallant poesy; and is said to have been the first that introduced the custom of singing love-songs in company. He is reported to have been one of the greatest eaters of his age; upon which Mr Bayle remarks, that such a quality would have been extremely inconvenient, if poetry had been at that time upon such a footing as it has been often since, not able to procure the poet bread. He died of a strange disease; for he was eat up with lice.

ALCMANIAN, in ancient lyric poetry, a kind of verse consisting of two dactyles and two trochees; as,—

Virgini|bus pue|risque|canto.

The word is formed from *Alcman*, the name of an ancient Greek poet, in great esteem for his erotics or amorous compositions.

ALCMENA, the daughter of Electryo king of Mycenæ, and wife of Amphitryon. Jupiter putting on the shape of her husband while he was abroad in the wars, begot Hercules upon her: he made that night as long as three ordinary ones.

ALCOCK (John), doctor of laws, and bishop of Ely in the reign of king Henry VII. was born at Beverly in Yorkshire, and educated at Cambridge. He was first made dean of Westminster, and afterwards appointed master of the rolls. In 1471, he was consecrated bishop of Rochester: in 1476, he was translated to the see of Worcester; and in 1486, to that of Ely, in the room of Dr John Morton, preferred to the see of Canterbury. He was a prelate of great learning and piety; and so highly esteemed by king Henry, that he appointed him lord president of Wales, and afterwards lord chancellor of England. Alcock founded a school at Kingston upon Hull, and built the spacious hall belonging to the episcopal palace at Ely. He was also the founder of Jesus-college in Cambridge, for a master, six fellows, and as many scholars. This house was formerly a nunnery, dedicated to St Radigund: and, as Godwin tells us, the building being greatly decayed, and the revenues reduced almost to nothing, the nuns had all forsaken it, except two; whereupon bishop Alcock procured a grant from the crown, and converted it into a college. But Cambden and others tell us, that the nuns of that house were so notorious for their incontinence, that king Henry VII. and pope Julius II. consented to its dissolution: Bale accordingly calls this nunnery *spiritualium meretricum cænobium*, "a community of spiritual harlots." Bishop Alcock wrote several pieces; amongst which are the following: 1. *Mons Perfectionis*. 2. *In Psalmos Penitentiales*. 3. *Homiliæ Vulgares*. 4. *Meditationes Piæ*. He died October 1. 1500; and was buried in the chapel he had built at Kingston upon Hull.

ALCOHOL, or ALKOOL, in chemistry, spirit of wine highly rectified †. It is also used for any highly rectified spirit.—Alcohol is extremely light and inflammable: It is a strong antiseptic, and therefore employed to preserve animal substances.

† See *Chemistry* (Index), and *Pharmacy*.

ALCOHOL is also used for any fine impalpable powder.

ALCOHOLIZATION, the process of rectifying any spirit. It is also used for pulverization.

ALCOR, in astronomy, a small star adjoining to the large bright one in the middle of the tail of *ursa major*.—The word is Arabic. It is a proverb among the Arabians, applied to one who pretends to see small things, but overlooks much greater: *Thou canst see Alcor, and not yet see the full moon.*

ALCORAN, or AL-KORAN, the scripture, or bible, of the Mahometans. The word is compounded of the Arabic particle *al*, and *coran* or *koran*, derived from the verb *caraa* or *karaa*, to read. The word therefore properly signifies, *the reading*; or rather, *that which ought to be read*. By this name the Mahometans denote not only the entire book or volume of the Koran, but also any particular chapter or section of it; just as the Jews call either the whole scripture, or any part of it, by the name of *Karah*, or *Mikra*, words of the same origin and import.

Besides this peculiar name, the Koran is also honoured with several appellations common to other books of scripture: as, *al Farkan*, from the verb *foraka*, *to divide* or *distinguish*; not, as the Mahometan doctors say, because those books are divided into chapters or sections, or distinguish between good and evil; but in the same notion that the Jews use the word *Perek*, or *Pirka*, from the same root, to denote a section or portion of scripture. It is also called *al Moshaf*, *the volume*, and *al Kitab*, *the book*, by way of eminence, which answers to the *Biblia* of the Greeks; and *al Dhikr*, *the admonition*, which name is also given to the Pentateuch and Gospel.

The Koran is divided into 114 larger portions of very unequal length, which we call *chapters*; but the Arabians *sowar*, in the singular *sura*; a word rarely used on any other occasion, and properly signifying a row, order, or a regular series; as a course of bricks in building, or a rank of soldiers in an army; and is the same in use and import with the Sura, or Tora, of the Jews, who also call the fifty-three sections of the Pentateuch *Sedarim*, a word of the same signification.

These chapters are not, in the manuscript copies, distinguished by their numerical order, but by particular titles, which are taken sometimes from a particular matter treated of, or person mentioned therein; but usually from the first word of note, exactly in the same manner as the Jews have named their Sedarim; though the word from which some chapters are denominated be very far distant, towards the middle, or perhaps the end, of the chapter; which seems ridiculous. But the occasion of this appears to have been, that the verse or passage

Alcoran. passage wherein such word occurs, was, in point of time, revealed and committed to writing before the other verses of the same chapter which precede it in order; and the title being given to the chapter before it was completed, or the passages reduced to their present order, the verse from whence such title was taken did not always happen to begin the chapter. Some chapters have two or more titles, occasioned by the difference of the copies.

Some of the chapters having been revealed at Mecca, and others at Medina, the noting this difference makes a part of the title: but the reader will observe, that several of the chapters are said to have been revealed partly at Mecca and partly at Medina; and, as to others, it is yet a dispute among the commentators to which of the two places they belong.

Every chapter is subdivided into smaller portions, of very unequal length also, which we customarily call *verses:* but the Arabic word is *ayat*, the same with the Hebrew *ototh*, and signifies *signs* or *wonders:* such as are the secrets of God, his attributes, works, judgements, and ordinances, delivered in those verses; many of which have their particular titles also, imposed in the same manner as those of the chapters.

Besides these unequal divisions of chapter and verse, the Mahometans have also divided their Koran into sixty equal portions, which they call *Ahzab*, in the singular *Hizb*, each subdivided into four equal parts; which is also an imitation of the Jews, who have an ancient division of their Mishma into sixty portions called *Massictoth*. But the Koran is more usually divided into thirty sections only, named *Ajza*, from the singular *Joz*, each of twice the length of the former, and in the like manner subdivided into four parts. These divisions are for the use of the readers of the Koran in the royal temples, or in the adjoining chapels where the emperors and great men are interred. There are thirty of these readers belonging to every chapel, and each reads his section every day; so that the whole Koran is read over once a-day.

Next after the title, at the head of every chapter, except only the ninth, is prefixed the following solemn form, by the Mahometants called the *Bismallah*, IN THE NAME OF THE MOST MERCIFUL GOD; which form they constantly place at the beginning of all their books and writings in general, as a peculiar mark or distinguishing characteristic of their religion, it being counted a sort of impiety to omit it. The Jews, for the same purpose, make use of the form, *In the name of the* LORD, or, *In the name of the great* GOD; and the eastern Christians that of, *In the name of the Father, and of the Son, and of the Holy Ghost.* But Mahomet probably took this form, as he did many other things, from the Persian Magi, who used to begin their books in these words, *Benam Yezdan bakshaishgher dadar;* that is, *In the name of the most merciful just* GOD.

There are twenty-nine chapters of the Koran, which have this peculiarity, that they begin with certain letters of the alphabet, some with a single one, others with more. These letters the Mahometans believe to be the peculiar marks of the Koran, and to conceal several profound mysteries; the certain understanding of which, the more intelligent confess, has not been communicated to any mortal, their prophet only excepted. Notwithstanding which, some will take the liberty of guessing at their meaning by that species of Cabala called by the Jews *Notarikon*, and suppose the letters to stand for as many words, expressing the names and attributes of God, his works, ordinances, and decrees; and therefore these mysterious letters, as well as the verses themselves, seem in the Koran to be called *signs*. Others explain the intent of these letters from their nature or organ, or else from their value in numbers, according to another species of the Jewish Cabala called *Gematria;* the uncertainty of which conjectures sufficiently appears from their disagreement. Thus, for example, five chapters, one of which is the second, begins with these letters, A. L. M. which some imagine to stand for *Allah latiff magid*, "GOD *is gracious and to be glorified;*" or, *Ana li minni*, i. e. *to me and from me*, viz. belongs all perfection, and proceeds all good; or else for *Ana Allah alam*, "*I am the most wise* GOD," taking the first letter to mark the beginning of the first word, the second the middle of the second word, and the third the last of the third word; or for *Allah, Gabriel, Mohammed*, the author, revealer, and preacher of the Koran. Others say, that as the letter A belongs to the lower part of the throat, the first of the organs of speech; L to the palate, the middle organ; and M to the lips, which are the last organ; so these letters signify that God is the beginning, middle, and end, or ought to be praised in the beginning, middle, and end, of all our words and actions: or, as the total value of those three letters, in numbers, is seventy-one, they signify, that, in the space of so many years, the religion preached in the Koran should be fully established. The conjecture of a learned Christian is at least as certain as any of the former, who supposes those letters were set there by the amanuensis, for *Amar li Mohammed*, i. e. *at the command of Mohammed*, as the five letters prefixed to the nineteenth chapter seem to be there written by a Jewish scribe, for *Coh yaas*, i. e. *Thus he commanded.*

The Koran is universally allowed to be written with the utmost elegance and purity of language, in the dialect of the tribe of Koreish, the most noble and polite of all the Arabians, but with some mixture, tho' very rarely, of other dialects. It is confessedly the standard of the Arabic tongue, and, as the more orthodox believe, and are taught by the book itself, inimitable by any human pen (though some sectaries have been of another opinion), and therefore insisted on as a permanent miracle, greater than that of raising the dead, and alone sufficient to convince the world of its divine original.

And to this miracle did Mahomet himself chiefly appeal for the confirmation of his mission, publicly challenging the most eloquent men in Arabia, which was at that time stocked with thousands whose sole study and ambition it was to excel in elegance of style and composition, to produce even a single chapter that might be compared with it (A).

(A) As the composition and arrangement of words, however, admit of infinite varieties, it can never be absolutely said that any one is the best possible. In fact, Hamzah Benahmed wrote a book against the Alcoran with at least equal elegance; and Moselema another, which even surpassed it, and occasioned a defection of a great part of the Mussulmans. *Journ. de Scav.* tom. xiii. p. 280. *Ouvr. de Scav.* Nov. 1708, p. 404.

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To the pomp and harmony of expreffion fome afcribe all the force and effect of the Alcoran; which they confider as a fort of mufic, equally fitted with other fpecies of that art to ravifh and amaze. In this Mahomet fucceeded fo well, and fo ftrangely captivated the minds of his audience, that feveral of his opponents thought it the effect of witchcraft and enchantment, as he himfelf complains.—Others have attributed the effect of the Alcoran to the frequent mention of rewards and punifhments; heaven and hell occurring almoft in every page. Some fuppofe, that the fenfual pleafures of paradife, fo frequently fet before the imaginations of the readers of the Alcoran, were what chiefly bewitched them. Tho', with regard to thefe, there is a great difpute whether they are to be underftood literally or fpiritually. Several have even allegorized the whole book.

The general defign of the Koran was to unite the profeffors of the three different religions, then followed in the populous country of Arabia (who for the moft part lived promifcuoufly, and wandered without guides, the far greater number being idolaters, and the reft Jews and Chriftians moftly of erroneous and heterodox belief), in the knowledge and worfhip of one God, under the fanction of certain laws, and the outward figns of ceremonies partly of ancient and partly of novel inftitution, enforced by the confideration of rewards and punifhments both temporal and eternal; and to bring them all to the obedience of Mahomet, as the prophet and ambaffador of God, who, after the repeated admonitions, promifes, and threats, of former ages, was at laft to eftablifh and propagate God's religion on earth, and to be acknowledged chief pontiff in fpiritual matters, as well as fupreme prince in temporal.

The great doctrine then of the Koran, is the unity of God; to reftore which point Mahomet pretended was the chief end of his miffion; it being laid down by him as a fundamental truth, That there never was, nor ever can be, more than one true orthodox religion. For, though the particular laws or ceremonies are only temporary, and fubject to alteration, according to the divine direction; yet the fubftance of it being eternal truth, is not liable to change, but continues immutably the fame. And he taught, that, whenever this religion became neglected, or corrupted in effentials, God had the goodnefs to re-inform and re-admonifh mankind thereof, by feveral prophets, of whom Mofes and Jefus were the moft diftinguifhed, till the appearance of Mahomet, who is their feal, and no other to be expected after him. The more effectually to engage people to hearken to him, great part of the Koran is employed in relating examples of dreadful punifhments formerly inflicted by God on thofe who rejected and abufed his meffengers; feveral of which ftories, or fome circumftances of them, are taken from the Old and New Teftaments, but many more from the apocryphal books and traditions of the Jews and Chriftians of thofe ages, fet up in the Koran as truths in oppofition to the fcriptures, which the Jews and Chriftians are charged with having altered: and indeed, few or none of the relations or circumftances in the Koran were invented by Mahomet, as is generally fuppofed, it being eafy to trace the greateft part of them much higher, as the reft might be, were more of thofe books extant, and was it worth while to make the inquiry.

The reft of the Alcoran is taken up in prefcribing neceffary laws and directions, frequent admonitions to moral and divine virtues, the worfhip and reverence of the Supreme Being, and refignation to his will. One of their moft learned commentators diftinguifhes the contents of the Alcoran into *allegorical* and *literal*; under the former are comprehended all the obfcure, parabolical, and enigmatical paffages, with fuch as are repealed, or abrogated; the latter, fuch as are clear, and in full force.

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The moft excellent moral in the whole Alcoran, interpreters fay, is that in the chapter *Al Alraf*, viz. Shew mercy, do good to all, and difpute not with the ignorant; or, as Mr Sale renders it, Ufe indulgence, command that which is juft, and withdraw far from the ignorant. Mahomet, according to the authors of the *Kefchaf*, having begged of the angel Gabriel a more ample explication of this paffage, received it in the following terms: "Seek him who turns thee out, give to "him who takes from thee, pardon him who injures "thee; for God will have you plant in your fouls the "roots of his chief perfections." It is eafy to fee that this commentary is copied from the gofpel.—In reality, the neceffity of forgiving enemies, though frequently inculcated in the Alcoran, is of a later date among the Mahometans than among the Chriftians; among thofe latter, than among the heathens; and to be traced originally among the Jews. (See Exodus xxxiii. 4, 5.) But it matters not fo much who had it firft, as who obferves it beft. The caliph Haffan, fon of Hali, being at table, a flave unfortunately let fall a difh of meat reeking hot, which fcalded him feverely. The flave fell on his knees, rehearfing thefe words of the Alcoran, "Paradife is for thofe who reftrain their "anger." I am not angry with thee, anfwered the caliph.—"And for thofe who forgive offences againft them," continues the flave. I forgive thee thine, replies the caliph.—"But above all, for thofe who return good for evil," adds the flave. I fet thee at liberty, rejoined the caliph; and I give thee ten dinars.

There are alfo a great number of occafional paffages in the Alcoran, relating only to particular emergencies. For this advantage Mahomet had in the piecemeal method of receiving his revelation, that whenever he happened to be perplexed and gravelled with any thing, he had a certain refource in fome new morfel of revelation. It was an admirable contrivance of his, to bring down the whole Alcoran at once, only to the loweft heaven, not to earth; fince, had the whole been publifhed at once, innumerable objections would have been made, which it would have been impoffible for him to folve: but as he received it by parcels, as God faw fit they fhould be publifhed for the converfion and inftruction of the people, he had a fure way to anfwer all emergencies, and to extricate himfelf with honour from any difficulty which might occur.

It is the general and orthodox belief among the Mahometans, that the Koran is of divine original; nay, that it is eternal and uncreated, remaining, as fome exprefs it, in the very effence of God: that the firft tranfcript has been from everlafting by God's throne, written on a table of vaft bignefs, called the *preferved table*, in which are alfo recorded the divine decrees paft and future: that a copy from this table, in one volume on paper, was by the miniftry of the angel Gabriel fent down to the loweft heaven, in the month of Ramadan, on the night

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of *power:* from whence Gabriel revealed it to Mahomet by parcels, some at Mecca, and some at Medina, at different times, during the space of 23 years, as the exigency of affairs required; giving him, however, the consolation to show him the whole (which they tell us was bound in silk, and adorned with gold and precious stones of paradise) once a-year; but in the last year of his life he had the favour to see it twice. They say, that few chapters were delivered entire, the most part being revealed piecemeal, and written down from time to time by the prophet's amanuensis in such a part of such and such a chapter, till they were completed, according to the directions of the angel. The first parcel that was revealed is generally agreed to have been the first five verses of the 96th chapter.

After the new-revealed passages had been from the prophet's mouth taken down in writing by his scribe, they were published to his followers; several of whom took copies for their private use, but the far greater number got them by heart. The originals, when returned, were put promiscuously into a chest, observing no order of time; for which reason it is uncertain when many passages were revealed.

When Mahomet died, he left his revelations in the same disorder, and not digested into the method, such as it is, in which we now find them. This was the work of his successor Abu Becr; who, considering that a great number of passages were committed to the memory of Mahomet's followers, many of whom were slain in their wars, ordered the whole to be collected, not only from the palm-leaves and skins on which they had been written, and which were kept between two boards or covers, but also from the mouths of such as had gotten them by heart. And this transcript, when completed, he committed to the custody of Haffa the daughter of Omar, one of the prophet's widows.

From this relation it is generally imagined that Abu Becr was really the compiler of the Koran; though, for aught appears to the contrary, Mahomet left the chapters complete as we now have them, excepting such passages as his successor might add or correct from those who had gotten them by heart; what Abu Becr did else, being perhaps no more than to range the chapters in their present order, which he seems to have done without any regard to time, having generally placed the longest first.

However, in the 30th year of the Hegira, Othman being then caliph, and observing the great disagreement in the copies of the Koran in the several provinces of the empire; those of Irak, for example, following the reading of Abu Musa al Ashari, and the Syrians that of Macdad Ebn Aswad; he, by the advice of the *companions*, ordered a great number of copies to be transcribed from that of Abu Becr, in Haffa's care, under the inspection of Zeid Ebn Thabet, Abd'allah Ebn Zobair, Said Ebn al As, and Ad'alrahman Ebn al Hareth the Makhzumite; whom he directed, that, wherever they disagreed about any word, they should write it in the dialect of the Koreish, in which it was at first delivered. These copies, when made, were dispersed in the several provinces of the empire, and the old ones burnt and suppressed. Though many things in Haffa's copy were corrected by the abovementioned revisers, yet some few various readings still occur.

In fine, the book of the Alcoran is held in the highest esteem and reverence among the Musselmans. They dare not so much as touch the Alcoran without being first washed, or legally purified; to prevent which, an inscription is put on the cover or label, *Let none touch but they who are clean.* It is read with great care and respect; being never held below the girdle. They swear by it; take omens from it on all weighty occasions; carry it with them to war; write sentences of it in their banners; adorn it with gold and precious stones; and knowingly suffer it not to be in the possession of any of a different religion. Some say that it is punishable even with death, in a Christian, to touch it; others, that the veneration of the Musselmans leads them to condemn the translating it into any other language as a profanation: but these seem to be aggravations. The Mahometans have taken care to have their scripture translated into the Persian, the Javan, the Malayan, and other languages; tho', out of respect to the original, these versions are generally, if not always, interlineated.

View of Christianity and Mahometanism, p. 257.

By the advocates of Mahometanism, the Koran, as already observed, has always been held forth as the greatest of miracles, and equally stupendous with the act of raising the dead. The miracles of Moses and Jesus, they say, were transient and temporary; but that of the Koran is permanent and perpetual; and therefore far surpasses all the miraculous events of preceding ages. We will not detract from the real merit of the Koran: we allow it to be generally elegant, and often sublime: but at the same time we reject with disdain its arrogant pretence to any thing supernatural; all the real excellence of the work being easily referable to natural and visible causes.

"In the language of Arabia, a language extremely loved and diligently cultivated by the people to whom it was vernacular, Mahomet found advantages which were never enjoyed by any former or succeeding impostor. It requires not the eye of a philosopher to discover in every soil and country a principle of national pride: and if we look back for many ages on the history of the Arabians, we shall easily perceive that pride among them invariably to have consisted in the knowledge and improvement of their native language. The Arabic, which has been justly esteemed the most copious of the Eastern tongues; which had existed from the remotest antiquity; which had been embellished by numberless poets, and refined by the constant exercise of the natives; was the most successful instrument which Mahomet employed in planting his new religion among them. Admirably adapted by its unrivalled harmony, and by its endless variety to add painting to expression, and to pursue the imagination in its unbounded flight; it became in the hands of Mahomet an irresistible charm to blind the judgment, and to captivate the fancy of his followers.

"Of that description of men, who first composed the adherents of Mahomet, and to whom the Koran was addressed, few, probably, were able to pass a very accurate judgment on the propriety of the sentiments, or on the beauties of the diction: but all could judge of the military abilities of their leader; and in the midst of their admiration it is not difficult to conceive, that they would ascribe to his compositions every imaginary beauty of inspired language.

"The shepherd and the soldier, though awake to the charms

Alcoran.

charms of those wild but beautiful compositions, in which were celebrated their favourite occupations of love or war, were yet little able to criticise any other works than those which were addressed to their imagination or the heart. To abstract reasonings on the attributes and the dispensations of the Deity, to the comparative excellencies of rival religions, to the consistency of any one religious system in all its parts, and to the force of its various proofs, they were quite inattentive. In such a situation, the appearance of a work which possessed something like wisdom and consistence; which prescribed the rules, and illustrated the duties of life; and which contained the principles of a new and comparatively sublime theology, independently of its real and permanent merit, was likely to excite their astonishment, and to become the standard of future composition.

"In the first periods of the literature of every country, something of this kind has happened. The father of Grecian poetry very obviously influenced the taste and imitation of his countrymen. The modern nations of Europe all possess some original author, who, rising from the darkness of former ages, has begun the career of composition, and tinctured with the character of his own imagination the stream which has flowed through his posterity.

"But the prophet of Arabia had in this respect advantages peculiar to himself. His compositions were not to his followers the works of man, but the genuine language of Heaven, which had sent him. They were not confined therefore to that admiration which is so liberally bestowed on the earliest productions of genius, or to that fond attachment with which men every where regard the original compositions of their country: but with their admiration they blended their piety. To know and to feel the beauties of the Koran, was in some respect to share in the temper of heaven; and he who was most affected with admiration in the perusal of its beauties, seemed most fitly the object of that mercy which had given it to ignorant man. The Koran, therefore, became naturally and necessarily the standard of taste. With a language thus hallowed in their imaginations, they were too well satisfied, either to dispute its elegance or improve its structure. In succeeding ages, the additional sanction of antiquity, or prescription, was given to these compositions which their fathers had admired: and while the belief of its divine original continues, that admiration, which has thus become the test and the duty of the faithful, can neither be altered nor diminished.

"When therefore we consider these peculiar advantages of the Koran, we have no reason to be surprised at the admiration in which it is held. But if, descending to a more minute investigation of it, we consider its perpetual inconsistence and absurdity, we shall indeed have cause for astonishment at that weakness of humanity which could ever have received such compositions as the work of the Deity.

"The first praise of all the productions of genius, is invention; that quality of the mind, which, by the extent and quickness of its views, is capable of the largest conceptions, and of forming new combinations of objects the most distant and unusual. But the Koran bears little impression of this transcendent character. Its materials are wholly borrowed from the Jewish and Christian scriptures, from the Talmudical legends and apocryphal gospels then current in the East, and from the traditions and fables which abounded in Arabia. The materials collected from these several sources are here heaped together, with perpetual and needless repetitions, without any settled principle or visible connection.

"When a great part of the life of Mahomet had been spent in preparatory meditation on the system he was about to establish, its chapters were dealt out slowly and separately during the long period of 23 years. Yet thus defective in its structure, and not less exceptionable in its doctrines, was the work which Mahomet delivered to his followers as the oracles of God.

"The most prominent feature of the Koran, that point of excellence in which the partiality of its admirers has ever delighted to view it, is the sublime notion it generally impresses of the nature and attributes of God. If its author had really derived these just conceptions from the inspiration of that Being whom they attempt to describe, they would not have been surrounded, as they now are on every side, with error and absurdity. But it might easily be proved, that whatever it justly defines of the divine attributes, was borrowed from our holy scripture; which even from its first promulgation, but especially from the completion of the New Testament, has extended the views and enlightened the understandings of mankind; and thus furnished them with arms, which have too often been ineffectually turned against itself by its ungenerous enemies.

"In this instance particularly, the copy is far below the great original, both in the propriety of its images, and the force of its descriptions. Our holy scriptures are the only compositions that can enable the dim sight of mortality to penetrate into the invisible world, and to behold a glimpse of the Divine perfections. Accordingly, when they would represent to us the happiness of Heaven, they describe it, not by any thing minute and particular, but by something general and great; something, that without descending to any determinate object, may at once by its beauty and immensity excite our wishes and elevate our affections. Though in the prophetical and evangelical writings the joys that shall attend us in a future state are often mentioned with ardent admiration, they are expressed rather by allusion than similitude, rather by indefinite and figurative terms, than by any thing fixed and determinate. 'Eye hath not seen, nor ear heard, neither have entered into the heart of man, the things which God hath prepared for them that love him.' 1 *Cor.* ii. 9. What a reverence and astonishment does this passage excite in every hearer of taste and piety? What energy, and at the same time what simplicity, in the expression? How sublime, and at the same time how obscure, is the imagery?

"Different was the conduct of Mahomet in his descriptions of heaven and of paradise. Unassisted by the necessary influence of virtuous intentions and Divine inspiration, he was neither desirous, nor indeed able, to exalt the minds of men to sublime conceptions, or to rational expectations. By attempting to explain what is inconceivable, to describe what is ineffable, and to materialize what in itself is spiritual; he absurdly and impiously aimed to sensualize the purity of the Divine essence. Thus he fabricated a system of incoherence, a religion of depravity, totally repugnant indeed to the

nature

nature of that Being, who, as he pretended, was its object; but therefore more likely to accord with the appetites and conceptions of a corrupt and fenfual age.

" That we may not appear to exalt our Scriptures thus far above the Koran by an unreafonable preference, we fhall produce a part of the fecond chapter of the latter, which is defervedly admired by the Mahometans, who wear it engraved on their ornaments, and recite it in their prayers. ' God! there is no God but he; the living, the felf-fubfifting: neither flumber nor fleep feizeth him: to him belongeth whatfoever is in heaven, and on earth. Who is he that can intercede with him but through his good pleafure? He knoweth that which is paft, and that which is to come. His throne is extended over heaven and earth, and the prefervation of both is to him no burden. He is the high, the mighty.' *Sale's Kor.* ii. p. 30. 4to edit.

" To this defcription who can refufe the praife of magnificence? Part of that magnificence, however, is to be referred to that verfe of the Pfalmift, whence it was borrowed, ' He that keepeth Ifrael, fhall neither flumber nor fleep.' *Pfal.* cxxi. 4.

" But if we compare it with that other paffage of the fame infpired Pfalmift, all its boafted grandeur is at once obfcured, and loft in the blaze of a greater light.

" O my God, take me not away in the midft of my days; thy years are throughout all generations. Of old haft thou laid the foundations of the earth; and the heavens are the work of thy hands. They fhall perifh, but thou fhalt endure: yea all of them fhall wax old, as doth a garment; as a vefture fhalt thou change them, and they fhall be changed; but thou art the fame, and thy years fhall not fail.'

" The Koran, therefore, upon a retrofpective view of thefe feveral circumftances, far from fupporting its arrogant claim to a fupernatural work, finks below the level of many compofitions confeffedly of human original; and ftill lower does it fall in our eftimation, when compared with that pure and perfect pattern which we juftly admire in the fcriptures of truth.

" It is therefore abundantly apparent, that no miracle either was externally performed for the fupport, or is internally involved in the compofition, of the Mahometan revelation."

Alcoran, is alfo figuratively applied to certain other books full of impieties and impoftures.—In this fenfe we meet with the *Alcoran* of the Cordeliers, which has made a great noife; wherein St Francis is extravagantly magnified, and put on a level with Jefus Chrift. The Alcoran of the Cordeliers is properly an extract of a very fcarce book, intitled, The conformity of the life of the feraphic father St Francis with the life of Chrift, publifhed in 15 0, 4to; fince, at Bologna, in folio. Erafmus Albertus, being by the elector of Brandenburg appointed to vifit a monaftery of Francifcans, found this book; and being ftruck with the extreme folly and abfurdity of it, collected a number of curiofities out of it, and publifhed them under the title of the *Alcoran* of the Francifcans, with a preface by Martin Luther.

ALCORANISTS, among Mahometans, thofe who adhere ftrictly to the letter or text of the alcoran, from an opinion of its ultimate fufficiency and perfection. The Perfians are generally *Alcoranifts*, as admitting the Alcoran alone for their rule of faith. The Turks, Tartars, Arabs, &c. befides the Alcoran, admit a multitude of traditions. The Alcoranifts, among Mahometans, amount to much the fame with the textuaries among the Jews. The Alcoranifts can find nothing excellent out of the Alcoran; are enemies of philofophers, metaphyficians, and fcholaftic writers. With them the Alcoran is every thing.

ALCOVE, among builders, a recefs, or part of a chamber feparated by an eftrade, or partition of columns, and other correfponding ornaments, in which is placed a bed of ftate, and fometimes feats to entertain company. Thefe alcoves are frequent in Spain; and the bed is raifed two or three afcents, with a rail at the foot.

ALCUINUS (Flaccus), an ecclefiaftic of the eighth century. Where he was born, is a matter of difpute; but, according to the moft probable opinion, it was in Yorkfhire. It is pretty certain, however, that he was educated at York, under the direction of archbifhop Egbert, as we learn from his own letters, in which he frequently calls that great prelate his beloved mafter, and the clergy of York the companions of his youthful ftudies. As he furvived venerable Bede about 70 years, it is hardly poffible that he could have received any part of his education under him, as fome writers of literary hiftory have affirmed; and it is worthy of obfervation, that he never calls that great man his mafter, though he fpeaks of him with the higheft veneration. It is not well known to what preferments he had attained in the church before he left England, though fome fay he was abbot of Canterbury. The occafion of his leaving his native country, was his being fent on an embaffy by Offa king of Mercia to the emperor Charlemagne; who contracted fo great an efteem and friendfhip for him, that he earneftly folicited, and at length prevailed upon him, to fettle in his court, and became his preceptor in the fciences. Alcuinus accordingly inftructed that great prince in rhetoric, logic, mathematics, and divinity; which rendered him one of his greateft favourites. " He was treated with fo much kindnefs and familiarity (fays a cotemporary writer) by the Emperor, that the other courtiers called him, by way of eminence, *the emperor's delight*." Charlemagne employed his learned favourite to write feveral books againft the heretical opinions of Felix Bifhop of Urgel in Catalonia, and to defend the orthodox faith againft that herefiarch, in the council of Francfort, A. D. 894; which he performed to the entire fatisfaction of the Emperor and council, and even to the conviction of Felix and his followers, who abandoned their errors. The Emperor confulted chiefly with Alcuinus on all things relating to religion and learning; and, by his advice, did many great things for the advancement of both. An academy was eftablifhed in the Imperial palace, over which Alcuinus prefided, and in which the princes and prime nobility were educated; and other acadamies were eftablifhed in the chief towns of Italy and France, at his inftigation, and under his infpection. " France (fays one of our beft writers of literary hiftory) is indebted to Alcuinus for all the polite learning it boafted of in that and the following ages. The univerfities of Paris, Tours, Fulden, Soiffons, and many others, owe

owe to him their origin and increafe; thofe of whom he was not the fuperior and founder, being at leaft enlightened by his doctrine and example, and enriched by the benefits he procured for them from Charlemagne." After Alcuinus had fpent many years in the moft intimate familiarity with the greateft prince of his age, he at length, with great difficulty, obtained leave to retire from court to his abbey of St Martin's at Tours. Here he kept up a conftant correfpondence by letters with Charlemagne; from which it appears, that both the emperor and his learned friend were animated with the moft ardent love to learning and religion, and conftantly employed in contriving and executing the nobleft defigns for their advancement. He compofed many treatifes on a great variety of fubjects, in a ftyle much fuperior in purity and elegance to that of the generality of writers in the age in which he flourifhed. Charlemagne often folicited him, with all the warmth of a moft affectionate friend, to return to court, and favour him with his company and advice; but he ftill excufed himfelf; and nothing could draw him from his retirement in his abbey of St Martin in Tours, where he died A. D. 804. His works were collected and publifhed by Andrew du Chefne in one volume folio, Paris, 1617. They confift of, 1. Tracts upon fcripture. 2. Tracts upon doctrine, difcipline, and morality. 3. Hiftorical treatifes, letters, and poems. Since that edition, there has been publifhed an incredible number of tracts, poems, &c. afcribed to this author, moft of which, in all probability, were not his.

ALCYON, the trivial name of a fpecies of alcedo. See ALCEDO.

ALCYONIUM, an obfolete name of a fubmarine plant. It is alfo ufed for a kind of coral, or aftroites, frequently found foffile in England.

ALCYONIUM *Stagnum* (anc. geog.), a lake in the territory of Corinth, whofe depth was unfathomable, and in vain attempted to be difcovered by Nero. Thro' this lake Bacchus is faid to have defcended to hell, to bring back Semele; (Paufanias).

ALCYONIUS (Peter), a learned Italian, who flourifhed in the 16th century. He was well verfed in the Greek and Latin tongues, and wrote fome pieces of eloquence which met with great approbation. He was corrector of the prefs a confiderable time for Aldus Manutius, and is intitled to a fhare in the praifes given to the editions of that learned printer. He publifhed a treatife concerning banifhment, which contained fo many fine paffages intermixed with others quite the reverfe, that it was thought he had tacked to fomewhat of his own, feveral fragments of a treatife of *Cicero de gloria;* and that afterwards, in order to fave himfelf from being detected in this theft, he burnt the manufcript of Cicero, the only one extant. Paulus Manutius, in his commentary upon thefe words of Cicero, *Librum tibi celeriter mittam de gloria,* "I will fpeedily fend you my treatife on glory;" has the following paffage relating to this affair: "He means (fays he) his two books On Glory, which were handed down to the age of our fathers; for Bernard Juftinian, in the index of his books, mentions *Cicero de Gloria.* This treatife, however, when Bernard had left his whole library to a nunnery, could not be found, though fought after with great care: nobody doubted but Peter Alcyonius, who, being phyfician to the nunnery, was entrufted with the library, had bafely ftole it. And truly, in his treatife Of Banifhment, fome things are found interfperfed here and there, which feem not to favour of Alcyonius, but of fome higher author." The two orations he made after the taking of Rome, wherein he reprefented very ftrongly the injuftice of Charles V. and the barbarity of his foldiers, were excellent pieces. There is alfo an oration afcribed to him, on the knights who died at the fiege of Rhodes.

ALDBOROUGH, a fea-port town in Suffolk, with a market on Saturdays. It is pleafantly fituated, in a dale, between a high hill to the weftward, on which its large old-built church ftands; the fea to the eaft, and its river running fouth-weft. It is a large, long, ordinary town, made up of two or three ftreets of low houfes, running parallel to each other. A quarter of a mile to the fouth lies Slaughden, where they have a commodious key, with warehoufes for fifh: more foutherly ftill, they have conveniences for drying their north-fea fifh. Their employment in the fifhery is their chief bufinefs, which is confiderable in the feafons for catching herrings and fprats; and it is the only place in England for curing red fprats. It is a town corporate, and fends two members to parliament. Towards the fea, it has fome pieces of cannon planted for its defence. It is 88 miles north-eaft from London. E. Long. 1. 32. N. Lat. 52. 50.

ALDBOROUGH, a market-town in the weft riding of Yorkfhire, feated on the river Oufe, 15 miles northweft of York, and 200 miles north of London. It fends two members to parliament. W. Long. 0. 20. N. Lat. 54. 15. It was anciently a Roman city, called *Ifurium Brigantium;* and feveral coins and monuments of the Saxons and Romans have been difcovered there.

ALDEBARAN, in aftronomy, a ftar of the firft magnitude, called in Englifh the *bull's eye*, as making the eye of the conftellation Taurus. Its longitude is 6 deg. 32 min. 9 fec. of Gemini, and its latitude 5 deg. 29 min. 40 fec. fouth.

ALDER-TREE, in botany. See BETULA.

ALDERHOLM, a pleafant ifland of Sweden, formed by the three arms of a river running thro' Gentle, a town of Nordland, in Sweden. Here is a wharf, a repofitory for planks and deals, two packing houfes, a large cuftomhoufe for taking toll of the fhips, an arfenal for cannon, and a grenary.

ALDERMAN, in the Britifh policy, a magiftrate fubordinate to the lord-mayor of a city or town-corporate. The number of thefe magiftrates is not limited, but is more or lefs according to the magnitude of the place. In London they are 26; each having one of the wards of the city committed to his care. This office is for life; fo that when one of them dies, or refigns, a ward-mote is called, who return two perfons, one of whom the lord-mayor and aldermen choofe to fupply the vacancy. All the aldermen are juftices of the peace, by a charter of 15 Geo. II. The aldermen of London, &c. are exempted from ferving inferior offices; nor fhall they be put upon affizes, or ferve on juries, fo long as they continue to be aldermen.

ALDERMAN, among our Saxon anceftors, was a degree of nobility anfwering to earl or count at prefent.

ALDERMAN was alfo ufed, in the time of king Edgar, for a judge or juftice. Thus we meet with the

the titles of *Aldermannus totius Angliæ*, *aldermannus regis*, *comitatus*, *civitatis*, *burgi*, *castelli*, *hundredi sive wapentachii*, *et novemdecimorum*. According to Spelman, the *aldermannus totius Angliæ* seems to have been the same officer who was afterwards styled *capitalis justiciarius Angliæ*, or chief-justice of England; the *aldermannus regis* seems to have been an occasional magistrate, answering to our justice of assize; and the *aldermannus comitatus*, a magistrate who held a middle rank between what was afterward called the *earl* and the *sheriff*; he sat at the trial of causes with the bishop: the latter proceeding according to ecclesiastical law, and the former declaring and expounding the common law of the land.

ALDERNEY, an island in the British channel, subject to the crown of Great Britain. It is about eight miles in compass, and is separated from Cape la Hogue, in Normandy, by a narrow streight, called the *Race of Alderney*, which is a very dangerous passage in stormy weather when the two currents meet; otherwise it is safe, and has depth of water for the largest ships. Thro' this streight the French fleet made their escape after their defeat at La Hogue, in 1692. It is a healthy island, has but one church, is fruitful both in corn and pasture, and is remarkable for a fine breed of cows. The inhabitants, for their greater safety, live together in a town of the same name. The number of houses are said to be 200, and the inhabitants 1000. It has but one harbour, called *Crabby*, which is at a good distance from the town; and is only fit for small vessels. To the west lie the range of rocks called the *Caskets*, so dangerous to mariners. W. Long. 2. 17. N. Lat. 49. 50.

ALDHELM (St), bishop of Shireburn in the time of the Saxon Heptarchy. He is said to have been the son of Kenred, brother to Ina, king of the West-Saxons; but, in the opinion of William of Malmsbury, his father was no more than a distant relation to the king. Having received the first part of his education in the school which one Macdulf, a learned Scot, had set up in the place where Malmsbury now stands, he travelled into France and Italy for his improvement. At his return home, he studied some time under Adrian abbot of St Augustine's in Canterbury, the most learned professor of the sciences who had ever been in England. In these different seminaries he acquired a very uncommon stock of knowledge; and became famous for his learning, not only in England, but in foreign countries: whence several learned men sent him their writings for his perusal and correction; particularly Prince Arcivil, a son of the king of Scotland, who wrote many pieces which he sent to Aldhelm, "intreating him to give them the last polish, by rubbing off their Scots rust." He was the first Englishman who wrote in the Latin language both in prose and verse, and composed a book for the instruction of his countrymen in the prosody of that language. Besides this, he wrote several other treatises on various subjects; some of which are lost, and others published by Martin Delrio and Canisius. Venerable Bede, who flourished in the end of this and the beginning of the next century, gives the following character of Aldhelm: "He was a man of universal erudition, having an elegant style, and being wonderfully well acquainted with books, both on philosophical and religious subjects." In fact, considering the cloud of ignorance by which he was surrounded, and the great difficulty of acquiring knowledge without proper instruction, Aldhelm was a very extraordinary man. From one of his letters to Hedda bishop of Winchester, concerning the nature of his studies whilst at Canterbury, he appears to have been indefatigably determined to acquire every species of learning in his power. For a copy of this curious epistle, see Henry's History, vol. ii. p. 320. King Alfred the Great declared, that Aldhelm was the best of all the Saxon poets; and that a favourite song, which was universally sung in his time, near 200 years after its author's death, was of his composition. When he was abbot of Malmsbury, having a fine voice, and great skill in music as well as poetry, and observing the backwardness of his barbarous countrymen to listen to grave instructions, he composed a number of little poems, which he sung to them after mass in the sweetest manner; by which they were gradually instructed and civilized. After this excellent person had governed the monastery of Malmsbury, of which he was the founder, about 30 years, he was made bishop of Shereburn, where he died A. D. 709.—He wrote, 1. *De octo vitiis principalibus*. This treatise is extant in *Bibliotheca Patrum* of Canisius. 2. *Ænigmaticum versus mille*. This, with several other of his poems, was published by Martin Delrio at Mentz, 8vo, 1601. 3. A book addressed to a certain king of Northumberland, named Alfrid, on various subjects. 4. *De vita monachorum*. 5. *De laude sanctorum*. 6. *De arithmetica*. 7. *De astrologia*. 8. A book against the mistake of the Britons concerning the celebration of Easter; printed by Sonius, 1576. 9. *De laude virginitatis*. Manuscript, in Bennet-college, Cambridge. Published among Bede's *Opuscula*. Besides many sonnets, epistles, and homilies in the Saxon language.

ALDPORT, an ancient name for Manchester. See MANCHESTER.

ALDRED, abbot of Tavistock, was promoted to the bishopric of Worcester in the year 1046. He was so much in favour with King Edward the Confessor, and had so much power over his mind, that he obliged him to be reconciled with the worst of his enemies, particularly with Swane son of the earl Goodwin, who had revolted against him, and came with an army to invade the kingdom. Aldred also restored the union and friendship between king Edward and Griffin king of Wales. He took afterwards a journey to Rome, and being returned into England, in the year 1054, he was sent ambassador to the emperor Henry II.; he staid a whole year in Germany, and was very honourably entertained by Herman archbishop of Cologn, from whom he learned many things relating to ecclesiastical discipline, which on his return he established in his own diocess. In the year 1058 he went to Jerusalem, which no archbishop or bishop of England had ever done before him. Two years after he returned to England; and Kinsius archbishop of York dying the 22d of December 1060, Aldred was elected in his stead on Christmas day following, and thought fit to keep his bishoprick of Worcester with the archbishopric of Canterbury, as some of his predecessors had done. Aldred went soon after to Rome, in order to receive the Pallium from the Pope: He was attended by Toston earl of Northumberland, Giso bishop of Wells, and Walter bishop of Hereford. The pope received Tos-

Aldred. ton very honourably, and made him fit by him in the fynod which he held againft the Simonifts. He granted to Gifo and Walter their requeft, becaufe they were tolerably well learned, and not accufed of fimony. But Aldred being by his anfwers found ignorant, and guilty of fimony, the pope deprived him very feverely of all honours and dignities; fo that he was obliged to return without the Pallium. On his way home he and his three fellow-travellers were attacked by fome robbers, who took from them all that they had, though they did not offer to kill them. This obliged them to return to Rome; and the pope, either out of compaffion, or by the threatenings of the earl of Northumberland, gave Aldred the Pallium; but he was obliged to refign his bifhopric of Worcefter. However, as the archbifhopric of York had been almoft entirely ruined by the many invafions of foreigners, king Edward gave the new archbifhop leave to keep twelve villages or manors which belonged to the bifhopric of Worcefter. Edward the Confeffor dying in 1066, Aldred crowned Harald his fucceffor. He alfo crowned William the Conqueror, after he had made him take the following oath, viz. that he would protect the holy churches of God and their leaders; that he would eftablifh and obferve righteous laws; that he would entirely prohibit and fupprefs all rapines and unjuft judgments. He was fo much in favour with the Conqueror, that this prince looked upon him as a father; and, though imperious in regard to every body elfe, he yet fubmitted to obey this archbifhop: John Bromton gives us an inftance of the king's fubmiffion, which at the fame time fhows the prelate's haughtinefs.—It happened one day, as the archbifhop was at York, that the deputy-governor or lord-lieutenant going out of the city with a great number of people, met the archbifhop's fervants, who came to town with feveral carts and horfes loaded with provifions. The governor afked them to whom they belonged; and they having anfwered they were Aldred's fervants, the governor ordered that all thefe provifions fhould be carried to the king's ftore-houfe. The archbifhop fent immediately fome of his clergy to the governor, commanding him to deliver the provifions, and to make fatisfaction to St Peter, and to him the faint's vicar, for the injury he had done them; adding, that if he refufed to comply, the archbifhop would make ufe of his apoftolic authority againft him, (intimating thereby that he would excommunicate him). The governor, offended at this proud meffage, ufed the perfons whom the archbifhop had fent him very ill, and returned an anfwer as haughty as the meffage was. Aldred thereupon went to London to make his complaint to the king; but in this very complaint he acted with his wonted infolence; for meeting the king in the church of St Peter at Weftminfter, he fpoke to him in thefe words: "Hearken, O William: when thou waft but a foreigner, and God, to punifh the fins of this nation, permitted thee to become mafter of it, after having fhed a great deal of blood, I confecrated thee, and put the crown upon thy head with bleffings; but now, becaufe thou haft deferved it, I pronounce a curfe over thee, inftead of a bleffing, fince thou art become the perfecutor of God's church, and of his minifters, and haft broken the promifes and the oaths which thou madeft to me before St Peter's altar." The king, terrified at this difcourfe, fell upon his knees, and humbly begged the prelate to tell him, by what crime he had deferved fo fevere a fentence. The noblemen, who were prefent, were enraged againft the archbifhop, and loudly cried out he deferved death, or at leaft banifhment, for having offered fuch an injury to his fovereign, and they preffed him with threatenings to raife the king from the ground. But the prelate, unmoved at all this, anfwered calmly, "Good men, let him lie there, for he is not at Aldred's but at St Peter's feet; he muft feel St Peter's power, fince he dared to injure his vice-gerent." Having thus reproved the nobles by his epifcopal authority, he vouchfafed to take the king by the hand, and to tell him the ground of his complaint. The king humbly excufed himfelf, by faying he had been ignorant of the whole matter; and begged of the noblemen to intreat the prelate, that he might take off the curfe he had pronounced, and to change it into a bleffing. Aldred was at laft prevailed upon to favour the king thus far; but not without the promife of feveral prefents and favours, and only after the king had granted him to take fuch a revenge on the governor as he thought fit. Since that time (adds the hiftorian) none of the noblemen ever dared to offer the leaft injury. It may be queftioned, which was more furprifing here, whether the archbifhop's haughtinefs, who dared to treat his fovereign after fo unbecoming a manner; or the king's ftupidity, who fuffered fuch infolence and audacioufnefs from a prieft?—The Danes having made an invafion in the north of England in the year 1668, under the conduct of Harold and Canute the fons of king Swane, Aldred was fo much afflicted at it, that he died of grief the 11th of September in that fame year, having befought God that he might not fee the defolation of his church and country.

Aldred, Aldrich.

ALDRICH (Robert), bifhop of Carlifle, was born at Burnham in Buckinghamfhire about the year 1493, and educated at Eaton-fchool; from whence, in 1507, he was elected fcholar of King's-college, Cambridge. where he took his degree in arts, and was afterwards proctor of the univerfity. In 1525, he was appointed mafter of Eaton fchool, then became fellow of that college, and finally provoft. In 1529, he went to Oxford, where, being firft incorporated bachelor of divinity, in the following year he proceeded doctor in that faculty: in 1531, he was made arch-deacon of Colchefter; in 1534, canon of Windfor; and the fame year, regiftrary of the order of the garter. He was confecrated bifhop of Carlifle in the year 1537, and died at Horncaftle in Lincolnfhire in 1556. He wrote, 1. *Epiftola ad Gul. Hormanum*, in Latin verfe; printed in Horman's *Antiboffican*, Lond. 1521, of which book Pitts erroneoufly makes Aldrich the author. 2. *Epigrammata varia*. 3. *Latin verfes, and another epiftle to Horman*, prefixed to the *Vulgaria puerorum* of that author, Lond. 1519, 4to. 4. *Anfwers to certain queries concerning the abufes of the mafs*; alfo *about receiving the facrament*.

ALDRICH (Dr Henry), an eminent Englifh divine and philofopher, born at London in 1647, was educated at Weftminfter fchool under the famous Dr Bufby, and admitted of Chrift-church college, Oxford. He

Aldrich.

He had a great ſhare in the controverſy with the Papiſts in the reign of James II. and biſhop Burnet ranks him among thoſe who examined all the points of popery with a ſolidity of judgment, clearneſs of argument, depth of learning, and vivacity of writing, far beyond any who had before that time written in our language. He rendered himſelf ſo conſpicuous, that at the revolution, when Maſſey the popiſh dean of Chriſt-church fled, his deanery was conferred on him. In this ſtation he behaved in an exemplary manner, and that fabric owes much of its beauty to his ingenuity: it was Aldrich who deſigned the beautiful ſquare called *Peckwater-Quadrangle*, which is eſteemed an excellent piece of architecture. In imitation of his predeceſſor Dr Fell, he publiſhed, yearly, a piece of ſome ancient Greek author, as a preſent to the ſtudents of his houſe: he publiſhed *A Syſtem of Logic*, with ſome other pieces; and the reviſing Clarendon's Hiſtory of the Rebellion was intruſted to him and biſhop Spratt; but it doth not appear that they made any additions, or conſiderable alterations in it, as has been aſſerted by Mr Oldmixon. Beſides his preferments above mentioned, Dr Aldrich was alſo rector of Wem in Shropſhire. He was choſen prolocutor of the convocation in 1702. This worthy perſon died at Chriſt-church on the 14th of December 1710. As to his character, he was a moſt univerſal ſcholar, and had a taſte for all ſorts of learning, eſpecially architecture. Sir John Hawkins has favoured the public with ſeveral particulars relative to Dr Aldrich's ſkill in muſic; and on account of the Doctor's eminence in this reſpect, Sir John hath given his life, with his head prefixed. His abilities as a muſician rank him, we are told, among the greateſt maſters of the ſcience. He compoſed many ſervices for the church, which are well known; as are alſo his anthems, nearly to the number of twenty. He adapted, with great ſkill and judgment, Engliſh words to many of the notes of Paleſtrina, Cariſſimi, Victoria, and other Italian compoſers for the church, ſome of which are frequently ſung in our cathedrals as anthems. By the happy talent which Dr Aldrich poſſeſſed, of naturalizing the compoſitions of the old Italian maſters, and accommodating them to an Engliſh ear, he increaſed the ſtores of our own church. Though the Doctor chiefly applied himſelf to the cultivation of ſacred muſic, yet, being a man of humour, he could divert himſelf by producing pieces of a lighter kind. There are two catches of his; the one, "Hark the bonny Chriſt-church Bells," the other intitled, "a Smoking Catch," to be ſung by four men ſmoking their pipes, which is not more difficult to ſing than diverting to hear. His love of ſmoking was, it ſeems, ſo exceſſive as to be an entertaining topic of diſcourſe in the univerſity. Such was Dr Aldrich's regard for the advancement of muſic, and the honour of its profeſſors, that he had formed a deſign of writing a hiſtory of the ſcience; and the materials from which he propoſed to compile it are yet extant in the library of his own college. It appears from theſe materials, that he had marked down every thing which he had met with concerning muſic and muſicians; but that he had wrought no part of them into any kind of form.

Dr Aldrich is of ſome note as a Latin poet. In the *Muſæ Anglicanæ*, we find two elegant copies of verſes by him; one on the acceſſion of King William III. and the other on the death of the Duke of Glouceſter. Sir John Hawkins hath preſerved a humorous tranſlation by him of the well-known Engliſh ballad,

Aldrich, Aldrovandus.

"A ſoldier and a ſailor,
"A tinker and a taylor," &c.

The following epigram, intitled "Cauſa Bibendi," is likewiſe aſcribed to Dr Aldrich:

"Si bene quid memini, Cauſæ ſunt quinque bibendi,
"*Hoſpitis Adventus*; *præſens Sitis*, atque *futura*;
"Aut *Vini Bonitas*; aut *quæ libet altera Cauſa*."

The epigram has been thus tranſlated:

"If on my theme I rightly think,
"There are five reaſons why men drink:
"Good wine, a friend, becauſe I'm dry,
"Or leſt I ſhould be by and by,
"Or any other reaſon why."

The tranſlation is not equal to the original. It is evident, from the verſes cited and referred to, that Dr Aldrich was of a very cheerful and pleaſant turn of mind. Indeed, he is always ſpoken of as having been a man of wit; and as one who, to his great talents and virtues, joined thoſe amiable qualities, which rendered him the object of general affection, as well as of general eſteem and reſpect. Having never been married, he appropriated his income to works of hoſpitality and benificence, and in encouraging learning to the utmoſt of his power, of which he was a moſt munificent patron, as well as one of the greateſt men in England, if conſidered as a Chriſtian or a gentleman. He had always the intereſt of his college at heart, whereof he was an excellent governor. And, as he was remarkable for modeſty and humility, concealing his name to thoſe ſeveral learned tracts he publiſhed, ſo at his death he appointed to be buried without any memorial in the cathedral; which his thrifty nephew complied with, depoſiting him on the ſouth ſide of biſhop Fell's grave, December 22, eight days after his deceaſe; which happened in the 63d or 64th year of his age.

ALDROVANDUS (Ulyſſes), profeſſor of philoſophy and phyſic at Bologna, the place of his nativity. He was a moſt curious inquirer into natural hiſtory, and travelled into the moſt diſtant countries on purpoſe to inform himſelf of their natural productions. Minerals, metals, plants, and animals, were the objects of his curious reſearches; but he applied himſelf chiefly to birds, and was at great expence to have figures of them drawn from the life. Aubert le Mire ſays, that he gave a certain painter, famous in that art, a yearly ſalary of 200 crowns, for 30 years and upwards; and that he employed at his own expence Lorenzo Bennini and Cornelius Swintus, as well as the famous engraver Chriſtopher Coriolanus. Theſe expences ruined his fortune, and at length reduced him to the utmoſt neceſſity; and it is ſaid that he died blind in an hoſpital at Bologna, at a great age, in 1605. Mr Bayle obſerves, that antiquity does not furniſh us with an inſtance of a deſign ſo extenſive and ſo laborious as that of Aldrovandus, with regard to natural hiſtory; that Pliny has treated of more kinds of ſubjects, but only touches lightly on them, ſaying but a little upon any thing, whereas Aldrovandus has collected all he could meet with. His compilation, or that compiled upon his

his plan, consists of 13 volumes in folio, several of which were printed after his death. He himself published his Ornithology, or History of Birds, in three folio volumes, in 1599; and his seven books Of Insects, which make another volume of the same size. The volume Of Serpents, three Of Quadrupeds, one Of Fishes, that Of exanguious Animals, the History of Monsters, with the Supplement to that of Animals, the treatise Of Metals, and the Dendrology or History of Trees, were published at several times after the death of Aldrovandus, by the care of different persons; and Aldrovandus is the sole author only of the first six volumes of this work, the rest having been finished and compiled by others, upon the plan of Aldrovandus: a most extensive plan, wherein he not only relates what he has read in naturalists, but remarks also what historians have written, legislators ordained, and poets feigned: he explains also the different uses which may be made of the things he treats of, in common life, in medicine, architecture, and other arts; in short, he speaks of morality, proverbs, devices, riddles, hieroglyphics, and many other things which relate to his subject.

ALDROVANDA, in botany, a genus of the pentandria order, belonging to the pentagynia class of plants; of which there is but one species. The calyx is divided into five parts; the petals are five; and the capsule has five valves, with ten seeds. It is a native of Italy and the Indies; and has no English name.

ALDUABIS (anc. geog.), a river of Celtic Gaul, which rising from Mount Jura, separating the Sequani from the Helvetii, and running through the county of Burgundy, or the Franche Comté, environs almost on every side the city of Besançon; and running by Dole, falls into the Saone near Chalone. In Cæsar it is called *Alduasdubis*; in Ptolemy, *Dubis*: now *le Doux*.

ALE, a fermented liquor obtained from an infusion of malt, and differing from beer chiefly in having a less proportion of hops. (See BREWING.). This liquor, the natural substitute of wine in such countries as could not produce the grape, was originally made in Egypt, the first planted kingdom, on the dispersion from the east, that was supposed unable to produce grapes. And, as the Noachian colonies pierced further into the west, they found, or thought they found, the same defect, and supplied it in the same manner. Thus the natives of Spain, the inhabitants of France, and the aborigines of Britain, all used an infusion of barley for their ordinary liquor: and it was called by the various names of *Cælia* and *Ceria* in the first country, *Cerevisia* in the second, and *Curmi* in the last; all literally importing only *the strong water*.

"All the several nations (says Pliny) who inhabit the west of Europe, have a liquor with which they intoxicate themselves, made of corn and water. The manner of making this liquor is somewhat different in Gaul, Spain, and other countries, and is called by many various names; but its nature and properties are every where the same. The people of Spain, in particular, brew this liquor so well, that it will keep good a long time. So exquisite is the cunning of mankind, in gratifying their vicious appetites, that they have thus invented a method to make water itself intoxicate." The method in which the ancient Britons, and other Celtic nations, made their ale, is thus described by Isidorus and Orosius. "The grain is steeped in water and made to germinate, by which its spirits are excited and set at liberty; it is then dried and grinded; after which it is infused in a certain quantity of water; which being fermented, becomes a pleasant, warming, strengthening, and intoxicating liquor." This ale was most commonly made of barley; but sometimes of wheat, oats, and millet.

Anciently the Welch and Scots had also two kinds of ale, called *common ale* and *spiced ale*; and their value was thus ascertained by law: "If a farmer hath no mead, he shall pay two casks of spiced ale, or four casks of common ale, for one cask of mead." By this law, a cask of spiced ale, nine palms in height, and 18 palms in diameter, was valued at a sum of money equal in efficacy to L. 7 : 10s. of our present money; and a cask of common ale, of the same dimensions, at a sum equal to L. 3 : 15s. This is a sufficient proof, that even common ale in this period was an article of luxury among the Welch, which could only be obtained by the great and opulent. Wine seems to have been quite unknown even to the kings of Wales in this period, as it is not so much as once mentioned in their laws; though Giraldus Cambrensis, who flourished about a century after the conquest, acquaints us, that there was a vineyard in his time at Maenarper, near Pembroke, in South Wales.

Ale was the favourite liquor of the Anglo-Saxons and Danes, as it had been of their ancestors the ancient Germans. Before their conversion to Christianity, they believed that drinking large and frequent draughts of ale was one of the chief felicities which those heroes enjoyed who were admitted into the hall of Odin.

There are various sorts of ale known in Britain, particularly *pale* and *brown*: the former is brewed from malt slightly dried; and is esteemed more viscid than the latter, which is made from malt more highly dried or roasted.

Pale ale brewed with hard waters, as those of springs and wells, is judged the most wholesome, in regard the mineral particles tend to prevent the cohesions of those drawn from the grain, and enable them to pass the proper secretions the better; softer waters, as those of rivers, and rain, seem better suited to draw out the substance of high-dried malts, which retain many igneous particles, best absorbed in a smooth vehicle.

In Staffordshire, they have a secret of fining ale in a very short time. Plot conjectures it to be done by adding alum, or vinegar, in the working.

Ale is prepared various ways, and of various ingredients, as of wheat, rye, millet, oats, barley, the berries of the quick-bean, &c.

Some have found that the juice which bleeds from the birch or sycamore is of great use on this occasion, applied instead of water. It makes one bushel of malt go as far as four in the common way.

Some have a method of preparing ale, so that it will keep, carried to the East or West Indies. The secret is, by mashing twice with fresh malt; boiling twice; and, after shipping it, putting to every five gallons two new-laid eggs whole, to remain therein. It is said, that, in a fortnight's time, the shells will be dissolved; and the eggs become like wind-eggs; and that afterwards the white would disappear and the yoke remain untouched.

Ale is generally held to be more diuretic than beer, in regard it is ſmoother, more ſoftening, and relaxing; ſo that where urine is to be promoted by facilitating the paſſage, ale is moſt likely to effect it.

Ale is flatulent; and hence ſometimes produces colics, and the cholera morbus: it is aceſcent; but it does not produce calcareous diſeaſes, as has been aſſerted.

If malt-liquor, of any degree of ſtrength, is become flat and tartiſh, as it is uſed, it ſhould be drawn out of the caſk into a jug, in which as many drams of powdered chalk is put as there are to be pints of liquor; thus a new ferment will be raiſed, a ſprightly taſte will be reſtored to the liquor, and its acidity will be deſtroyed. Tart liquors of this kind are apt to produce a dyſury, ſtrangury, or a gonorrhœa; in which caſes, a ſmall quantity of brandy may be taken.

The conſumption of ale in theſe kingdoms is incredible. It was computed twenty years ago at the value of four millions yearly, including Great Britain and Ireland.

The duties on ale and beer make a principal branch of the revenue in Britain. They were firſt impoſed by the 12th of Car. II. and have been continued by ſeveral ſubſequent acts of parliament to firſt Geo. III. which lays an additional duty of 3d. per barrel. In the whole, the brewer of ale and beer for ſale ſhall pay 8s. for every barrel of either, above 6s. a barrel; and for every barrel of 6s. or under, the ſum of 1s. 4d.

Medicated Ales, thoſe wherein medicinal herbs have been infuſed, or added during the fermentation. See Pharmacy, (Index).

Gill Ale, is that in which the dried leaves of gill or ground-ivy have been infuſed. It is eſteemed abſterſive and vulnerary, and conſequently good in diſorders of the breaſt and obſtructions of the viſcera.

Ale-Conner, an officer in London, who inſpects the meaſures uſed in public-houſes. There are four ale-conners, who are all choſen by the common council of the city.

Ale-Houſes muſt be licenſed by juſtices of the peace, who take recognizances of the perſons licenſed, and of their ſureties, viz. 10 l. each, that they will not ſuffer unlawful gaming, nor other diſorderly practices in their houſes. Every perſon, excepting thoſe who ſell ale in fairs, neglecting to procure a licence, is liable to a penalty of 40 s. for the firſt offence, 4 l. for the ſecond, and 6 l. for the third, with all coſts. The licence is granted on the firſt of September, or within twenty days after, at a general meeting of the juſtices for the diviſion to which he belongs, upon his producing a certificate to his character, unleſs, by living in a city or town-corporate, this laſt circumſtance is diſpenſed with, and continues in force for one year only. Ale-houſe keepers, ſelling ale in ſhort meaſure, are liable to a penalty not exceeding 40s. and not leſs than 10s. and likewiſe to a fine of 10s. for permitting tipling, &c.

By 29th Geo. II. c. 12. perſons keeping ale-houſes in Scotland ſhall be licenſed as in England, and the juſtices there ſhall meet annually to licenſe ale-houſes; on each of which licenſes a fee of 1 s. is payable to the clerk of the peace. Magiſtrates of royal boroughs ſhall meet yearly for the like purpoſe; but where there ſhall not be a ſufficient number of magiſtrates to act in any royal borough, juſtices may grant licenſes, to be in force for one year only. Ibid.

Perſons in Scotland convicted of keeping unlicenſed ale-houſes ſhall forfeit for the firſt offence 5s. for the ſecond 10 s. for the third 20 s. and to be diſqualified; and for every ſubſequent offence 40 s. to be levied by diſtreſs and ſale, one moiety to the informer, the other to the poor of the pariſh. Conviction to be intimated to the offender, and certified to the clerk of the peace, and recorded: but perſons aggrieved may appeal to the quarter ſeſſions. Ibid.

Licenſes for houſes on the military roads in Scotland ſhall be iſſued on payment of 1 s. only to the clerk of the peace: making out licenſes before the ſame be ſtamped, is a penalty of 10 l. and making them contrary to the intention of this act, 5 l. and the ſame ſhall be vacated, unleſs the duty and fine be paid, and the receipt produced, and licenſe ſtamped. Ibid.

Ale-Silver, a tax paid annually to the lord-mayor of London, by all who ſell ale within the city.

ALEA, in Roman antiquity, denotes in general all manner of games of chance; but, in a more reſtricted ſenſe, was uſed for a particular game played with dice and tables, not unlike our backgammon.

ALEANDER (Jerome), cardinal and archbiſhop of Brindiſi, was born in 1480; and diſtinguiſhed himſelf at the beginning of the reformation, by the oppoſition he made to Luther: for being ſent into Germany as the pope's nuncio in 1519, he acted, as occaſion ſerved, in the character both of ambaſſador and doctor; and declaimed three hours together againſt Luther's doctrine before the diet of Worms, but could not prevent that celebrated reformer from being heard in that diet. He publiſhed ſeveral works, and died at Rome in 1542.

Aleander (Jerome), a learned man of the ſeventeenth century, born in the principality of Friuli, of the ſame family with the preceding. When he went to Rome, he was employed as ſecretary under cardinal Octavius Bandini, and diſcharged this office with great honour for almoſt twenty years. He afterwards, by the perſuaſion of Urban VIII. who had a great eſteem for him, became ſecretary to Cardinal Barberini, whom he accompanied to Rome when he went there in the character of legate *à latere*, and in whoſe ſervice he died in 1631. He was one of the firſt members of the academy of Humoriſts, wrote a learned treatiſe in Italian on the device of the ſociety, and diſplayed his genius on many different ſubjects. Barberini gave him a magnificent funeral at the academy of Humoriſts; the academiſts carried his corpſe to the grave; and Gaſpar Simeonibus, one of the members, made his funeral oration.

ALECTO, one of the Furies, daughter of Acheron and Night, or, as others would have it, of Pluto and Proſerpine.

ALECTORIA, a ſtone ſaid to be formed in the gall-bladders of old cocks, to which the ancients aſcribed many fabulous virtues. This is otherwiſe called *Alectorius Lapis*, ſometimes *Alectorolithos*, in Engliſh the *cock-ſtone*. The more modern naturaliſts hold the *alectorius lapis* to be originally ſwallowed down, not generated in, the ſtomach or gizzard of cocks and capons. It is known that many of the fowl-kind make a practice of ſwallowing pebbles, as it is ſuppoſed to be of ſervice in the buſineſs of trituration and digeſtion.

ALECTOROMANTIA, in antiquity, a ſpecies of divination performed by means of a cock. This is other-

otherwiſe called *Alectryomancy;* of which there appear to have been different ſpecies. But that moſt ſpoken of by authors was in the following manner: A circle being deſcribed on the ground, and divided into twenty-four equal portions, in each of theſe ſpaces was written one of the letters of the alphabet, and on each of the letters was laid a grain of wheat; after which, a cock being turned looſe in the circle, particular notice was taken of the grains picked up by the cock, becauſe the letters under them, being formed into a word, made the anſwer deſired. It was thus, according to Zonaras, that Libanius and Jamblicus ſought who ſhould ſucceed the emperor Valens; and the cock eating the grains anſwering to the ſpaces ΘΕΟΔ, ſeveral whoſe names began with thoſe letters, as Theodotus, Theodiſtes, Theodulus, &c. were put to death; which did not hinder, but promote, Theodoſius to the ſucceſſion. But the ſtory, however current, is but ill ſupported: It has been called in queſtion by ſome, and refuted by others, from the ſilence of Marcellinus, Socrates, and other hiſtorians of that time.

A-LEE, in the ſea-language, a term only uſed when the wind, croſſing or flanking the line of a ſhip's courſe, preſſes upon the maſts and ſails ſo as to make her incline to one ſide, which is called the lee-ſide: hence, when the helm is moved over to this ſide, it is ſaid to be *a-lee*, or *hard-a-lee*.

ALEGAMBE (Philip), a celebrated Jeſuit, born at Bruſſels in 1592, diſtinguiſhed himſelf by publiſhing a Bibliotheque of the writers of his order, and died at Rome in 1652.

ALEGRETTE, a ſmall town of Portugal, in Alentejo, on the confines of Port Alegre, on the river Caja, which falls into the Guadiana, a little below Badajoz, near the frontiers of Spaniſh Eſtremadura. It is a very pretty town, and finely ſituated; ſeven miles ſouth-eaſt of Port Alegre, and thirty north of Elvas. W. Long. 5. 20. N. Lat. 39. 6.

ALEIUS CAMPUS (anc. geog.), a plain in Cilicia, on this ſide the river Pyramus, near the mountain Chimera, famous for Bellerophon's wandering and periſhing there, after being thrown off Pegaſus; which is the reaſon of the appellation.

ALEMANIA, or ALLEMANIA, (anc. geog.) a name of Germany, but not known before the time of the Antonines, and then uſed only for a part. After the Marcomanni and their allies had removed from the Rhine, a rabble, or collection of people from all parts of Gaul, as the term *Alemanni* denotes, prompted either by levity or poverty, occupied the Agri, called *Decumates* by Tacitus, becauſe they held them on a tithe; now ſuppoſed to be the duchy of *Wirtemburg*. Such appear to be the ſmall beginnings of Alemania, which was in after-times greatly enlarged: but ſtill it was conſidered as a diſtinct part; for Caracalla, who conquered the Alemanni, aſſumed the ſurname both of *Alemannicus* and *Germanicus*.

ALEMBDAR, an officer in the court of the Grand Signior, who bears the green ſtandard of Mahomet, when the ſultan appears in public on any ſolemn occaſion.

ALEMBERT (John le Rond d'), an eminent French philoſopher, was born at Paris in 1717. He derived the name of John le Rond from that of the church near which, after his birth, he was expoſed as a foundling. His father, informed of this circumſtance, liſtened to the voice of nature and duty, took meaſures for the proper education of his child, and for his future ſubſiſtence in a ſtate of eaſe and independence.

He received his firſt education in the College of the Four Nations, among the Janſeniſts, where he gave early marks of capacity and genius. In the firſt year of his philoſophical ſtudies, he compoſed a Commentary on the Epiſtle of St Paul to the Romans. The Janſeniſts conſidered this production as an omen that portended to the party of Port-Royal a reſtoration to ſome part of their ancient ſplendor, and hoped to find one day in M. d'Alembert a ſecond Paſcal. To render this reſemblance more complete, they engaged their riſing pupil in the ſtudy of the mathematics; but they ſoon perceived that his growing attachment to this ſcience was likely to diſappoint the hopes they had formed with reſpect to his future deſtination: they, therefore, endeavoured to divert him from this line; but their endeavours were fruitleſs.

At his leaving college, he found himſelf alone and unconnected in the world; and ſought an aſylum in the houſe of his *nurſe*. He comforted himſelf with the hope, that his fortune, though not ample, would better the condition and ſubſiſtence of that family, which was the only one that he could conſider as his own: Here, therefore, he took up his reſidence, reſolving to apply himſelf entirely to the ſtudy of geometry: And here he lived, during the ſpace of forty years, with the greateſt ſimplicity, diſcovering the augmentation of his means only by increaſing diſplays of his beneficence, concealing his growing reputation and celebrity from theſe honeſt people, and making their plain and uncouth manners the ſubject of good-natured pleaſantry and philoſophical obſervation. His good nurſe perceived his ardent activity; heard him mentioned as the writer of many books; but never took it into her head that he was a great man, and rather beheld him with a kind of compaſſion. "*You will never*," ſaid ſhe to him one day, "*be any thing but a philoſopher—and what is a philoſopher?—a fool, who toils and plagues himſelf during his life, that people may talk of him when* HE IS NO MORE."

As M. d'Alembert's fortune did not far exceed the demands of neceſſity, his friends adviſed him to think of a profeſſion that might enable him to augment it. He accordingly turned his views to the law, and took his degrees in that line; but ſoon abandoned this plan, and applied to the ſtudy of medicine. Geometry, however, was always drawing him back to his former purſuits, and after many ineffectual efforts to reſiſt its attractions, he renounced all views of a lucrative profeſſion, and gave himſelf over entirely to mathematics and poverty.

In the year 1741 he was admitted member of the Academy of Sciences; for which diſtinguiſhed literary promotion, at ſuch an early age, he had prepared the way by correcting the errors of a celebrated work *, which was deemed *claſſical* in France in the line of geometry. He afterwards ſet himſelf to examine, with deep attention and aſſiduity, what muſt be the motion of a body which paſſes from one fluid into another more denſe, in a direction not perpendicular to the ſurface ſeparating the two fluids. Every one knows the phenomenon which happens in this caſe, and which amuſes

* The *Analyſe demontrée* of F. Beinau.

amuſes children under the denomination of *Ducks and Drakes;* but M. d'Alembert was the firſt who explained it in a ſatisfactory and philoſophical manner.

Two years after his election to a place in the academy, he publiſhed his *Treatiſe on Dynamics.* The new principle developed in this treatiſe conſiſted in eſtabliſhing equality, at each inſtant, between the changes that the motion of a body has undergone, and the forces or powers which have been employed to produce them; or to expreſs the thing otherwiſe, in ſeparating into *two parts* the action of the moving powers, and conſidering the *one* as producing alone the motion of the body, in the ſecond inſtant, and the *other* as employed to deſtroy that which it had in the firſt.

So early as the year 1744, M. d'Alembert had applied this principle to the theory of the equilibrium, and the motion of fluids; and all the problems before ſolved by geometricians became, in ſome meaſure, its corollaries. The diſcovery of this new principle was followed by that of a new calculus, the firſt trials of which were publiſhed in a *Diſcourſe on the general Theory of the Winds,* to which the prize-medal was adjudged by the academy of Berlin in the year 1746, and which was a new and brilliant addition to the fame of M. d'Alembert. This new calculus of partial differences he applied, the year following, to the problem of vibrating chords, whoſe ſolution, as well as the theory of the oſcillations of the air and the propagation of ſound, had been given but incompletely by the geometricians who preceded him, and theſe were his maſters or his rivals.

In the year 1749 he furniſhed a method of applying his principle to the motion of any body of a given figure; and he ſolved the problem of the preceſſion of the equinoxes, determined its *quantity,* and explained the phenomenon of the nutation of the terreſtrial axis diſcovered by Dr Bradley.

In 1752, M. d'Alembert publiſhed a treatiſe on the *Reſiſtance of Fluids,* to which he gave the modeſt title of an *Eſſay;* but which contains a multitude of original ideas and new obſervations. About the ſame time he publiſhed, in the Memoirs of the Academy of Berlin, *Reſearches concerning the Integral Calculus,* which is greatly indebted to him for the rapid progreſs it has made in the preſent century.

While the ſtudies of M. d'Alembert were confined to geometry, he was little known or celebrated in his native country. His connections were limited to a ſmall ſociety of ſelect friends: he had never ſeen any man in high office except Meſſrs d'Argenſon. Satisfied with an income which furniſhed him with the neceſſaries of life, he did not aſpire after opulence or honours, nor had they been hitherto beſtowed upon him, as it is eaſier to confer them on thoſe who ſolicit them, than to look out for men who deſerve them. His cheerful converſation, his ſmart and lively ſallies, a happy knack at telling a ſtory, a ſingular mixture of malice of ſpeech with goodneſs of heart, and of delicacy of wit with ſimplicity of manners, rendered him a pleaſing and intereſting companion, and his company conſequently was much ſought after in the faſhionable circles. His reputation, at length, made its way to the throne, and rendered him the object of royal attention and beneficence. He received alſo a penſion from government, which he owed to the friendſhip of Count d'Argenſon.

The tranquillity of M. d'Alembert was abated when his fame grew more extenſive, and when it was known beyond the circle of his friends, that a fine and enlightened taſte for literature and philoſophy accompanied his mathematical genius. Our author's eulogiſt aſcribes to envy, detraction, and to other motives nearly as ungenerous, all the diſapprobation, oppoſition, and cenſure that M. d'Alembert met with on account of the publication of the famous Encyclopedical Dictionary of Arts and Sciences, in conjunction with Diderot. None ſurely will refuſe the well-deſerved tribute of applauſe to the eminent diſplays of genius, judgment, and true literary taſte, with which M. d'Alembert has enriched the great work now mentioned. Among others, the Preliminary Diſcourſe he has affixed to it, concerning the riſe, progreſs, connections, and affinities of all the branches of human knowledge, is perhaps one of the moſt capital productions of which the philoſophy of the preſent age can boaſt. Nor will it be diſputed, that the maſter-builders of this new and ſtupendous *temple* of ſcience, for the worſhip of NATURE, had alſo really in view the advancement of human knowledge, and the improvement of the arts and ſciences. This, no *true,* no candid philoſopher, will call in queſtion. But that in the *inner court* of this temple there was a confederacy formed againſt all thoſe who looked higher than *nature,* for the principal object of their veneration and confidence, is a fact too palpable, nay too boldly avowed, to ſtand in need of any proof.

Monthly Review for Mar. 1787.

Some time after this, d'Alembert publiſhed his Philoſophical, Hiſtorical, and Philological Miſcellanies. Theſe were followed by the Memoirs of Chriſtina Queen of Sweden; in which M. d'Alembert ſhowed that he was acquainted with the natural rights of mankind, and was bold enough to aſſert them. His *Eſſay on the Intercourſe of Men of Letters with Perſons high in Rank and Office,* wounded the former to the quick, as it expoſed to the eyes of the public the ignominy of thoſe ſervile chains, which they feared to ſhake off, or were proud to wear. A lady of the court hearing one day the author accuſed of having exaggerated the deſpotiſm of the great, and the ſubmiſſion they require, anſwered ſlyly, *If he had conſulted me, I would have told him ſtill more of the matter.*

M. d'Alembert gave very elegant ſpecimens of his literary abilities in his tranſlations of ſome ſelect pieces of Tacitus. But theſe occupations did not divert him from his mathematical ſtudies: for about the ſame time he enriched the Encyclopédie with a multitude of excellent articles in that line, and compoſed his *Reſearches on ſeveral important Points of the Syſtem of the World,* in which he carried to a higher degree of perfection the ſolution of the problem of the perturbations of the planets, that had ſeveral years before been preſented to the Academy.

In 1759 he publiſhed his *Elements of Philoſophy:* a work extolled as remarkable for its preciſion and perſpicuity; in which, however, are ſome tenets relative both to metaphyſics and moral ſcience, that are far from being admiſſible.

The reſentment that was kindled (and the diſputes that followed it) by the article *Geneva,* inſerted in the Encyclopédie,

Encyclopédie, are well known. M. d'Alembert did not leave this field of controversy with flying colours. Voltaire was an auxiliary in the conteſt: but as, in point of candour and decency, he had no reputation to loſe; and as he weakened the blows of his enemies, by throwing both them and the ſpectators into fits of laughter, the iſſue of the war gave him little uneaſineſs. It fell more heavily on d'Alembert; and expoſed him, even at home, to much contradiction and oppoſition.

It was on this occaſion that the late king of Pruſſia offered him an honourable aſylum at his court, and the place of preſident of his academy; and was not offended at his refuſal of theſe diſtinctions, but cultivated an intimate friendſhip with him during the reſt of his life. He had refuſed, ſome time before this, a propoſal made by the empreſs of Ruſſia to intruſt him with the education of the Grand Duke;— a propoſal accompanied with all the flattering offers that could tempt a man, ambitious of titles, or deſirous of making an ample fortune: but the objects of his ambition were tranquillity and ſtudy.

In the year 1765, he publiſhed his *Diſſertation on the Deſtruction of the Jeſuits.* This piece drew upon him a ſwarm of adverſaries, who confirmed the merit and credit of his work by their manner of attacking it.

Beſide the works already mentioned, he publiſhed nine volumes of memoirs and treatiſes, under the title of *Opuſcules;* in which he has ſolved a multitude of problems relative to aſtronomy, mathematics, and natural philoſophy; of which our panegyriſt gives a particular account, more eſpecially of thoſe which exhibit new ſubjects, or new methods of inveſtigation.

He publiſhed alſo *Elements of Muſic;* and rendered, at length, the ſyſtem of Rameau intelligible; but he did not think the mathematical theory of the ſonorous body ſufficient to account for the rules of that art. He was always fond of muſic; which, on the one hand, is connected with the moſt ſubtle and learned reſearches of rational mechanics; while, on the other, its power over the ſenſes and the ſoul exhibits to philoſophers phenomena no leſs ſingular, and ſtill more inexplicable.

In the year 1772 he was choſen ſecretary to the French academy. He formed, ſoon after this preferment, the deſign of writing the lives of all the deceaſed academicians, from 1700 to 1772; and in the ſpace of three years he executed this deſign, by compoſing 70 eulogies.

M. d'Alembert died on the 29th of October 1783. There were many amiable lines of candour, modeſty, diſintereſtedneſs, and beneficence, in his moral character; which are deſcribed, with a diffuſive detail, in his eulogium, by M. Condorcet, *Hiſt. de l'Acad. Royale des Sciences*, 1783.

ALEMBIC, a chemical veſſel, uſually made of glaſs or copper, formerly uſed for diſtillation. The bottom part, which contained the ſubject for diſtillation, is called, from its ſhape, the *cucurbit;* the upper part, which receives and condenſes the ſteam, is called the *head*, the beak of which is fitted into the neck of a receiver. Retorts, and the common *worm-ſtill*, are now more generally employed.

ALEMBROTH, in the writings of the alchemiſts, a word uſed for a ſort of fixed alkaline ſalt, which had the power of the famous alkaheſt, in diſſolving bodies, opening the pores of moſt or all known ſubſtances, and thence, as well as by deſtroying ſulphurs, promoting the ſeparation of metals from their ores.—It is alſo uſed for a compound of corroſive mercury and ſal ammoniac. See CHEMISTRY.

ALENIO (Julius), a Jeſuit, born at Breſcia in the republic of Venice. He travelled into the eaſtern countries; and arrived at Maca in 1610, where he taught mathematics. From thence he went to the empire of China, where he continued to propagate the Chriſtian religion for thirty-ſix years. He was the firſt who planted the faith in the province of Xanſi, and he built ſeveral churches in the province of Fokien. He died in Auguſt 1649, leaving behind him ſeveral works in the Chineſe language.

ALENTEJO, a province of Portugal, between the rivers of Tajo and Guadiana: the ſoil is very fertile, and the inhabitants laborious and induſtrious. The principal town is Ebora.

ALENZON, a large handſome town of France, in lower Normandy, with the title of a duchy. It is ſurrounded with good walls, and flanked with towers. The caſtle was formerly a place of great conſequence, and has held out long ſieges. It has but one pariſh-church, which has a bold and noble front. Among the nunneries, that of St Clair is moſt remarkable. It is ſeated on the river Sarte, in a vaſt open plain, which produces all ſorts of corn and fruit. Near it there are quarries of ſtone fit for building, wherein are found a ſort like Briſtol ſtones. The linen made at Alenzon is very good, and ſells at Paris. It is 20 miles north of Mans, 63 ſouth-by-weſt of Rouen, and 88 ſouth-weſt of Paris. Lon. 0. 10. N. lat. 48. 25.

ALEPPO, or HALAB, the capital of the Pachalic, and of all Syria, and the ordinary reſidence of the pacha, is ſituated in the vaſt plain which extends from the Orontes to the Euphrates, and which towards the ſouth terminates in the deſert. It is built on eight hills or eminences, on the higheſt of which the caſtle is erected, and is ſuppoſed to be the ancient Beræa. This mount is of a conic form, and ſeems in a great meaſure to be raiſed with the earth thrown up out of a deep broad ditch which ſurrounds it. The ſuburbs to the north-north-eaſt are next in height to this, and thoſe to the weſt-ſouth-weſt are much lower than the parts adjacent, and than any other part of the city. The houſes are large and commodious, having terraces on their tops, and generally ſky-lights in form of a dome to let the light into the rooms, which from their loftineſs, the gilding on the window-ſhutters, cupboard-doors, &c. have at firſt entrance a very grand and agreeable effect. They are all ſo equal in height, that there are ſeldom any ſteps to aſcend or deſcend in going from one houſe to another; while ſeveral large vaulted ſtreets increaſe the facility of communication, by affording a paſſage to every part of the city free from the embarraſſment of the open ſtreets. They are carefully paved; have gutters and a foot-pavement on each ſide; and the middle of the ſtreet is laid with brick, the ſmall end upwards, for the convenience of the horſes. There is alſo a cleanlineſs obſerved here unknown to the other cities of Turkey, and which is not attended with the trouble of our ſcavengers, there being

being aſs-drivers who go about the city and take up the rubbiſh and duſt, which each inhabitant is obliged to ſweep together; and though the heat of the climate renders this labour more eaſy, the ſame heat obliges them to greater cleanlineſs in order to preſerve the ſalubrity of the air.

The moſques in Aleppo are numerous, and ſome few of them magnificent. Before each of them is an area, with a fountain in the middle, deſigned for ablutions before prayers; and behind ſome of the larger there are little gardens. There are many large khans, or caravanſeras, conſiſting of a capacious ſquare, on all ſides of which are a number of rooms, built on a ground-floor, uſed occaſionally for chambers, ware-houſes, or ſtables. Above ſtairs there is a colonade or gallery on every ſide, in which are the doors of a number of ſmall rooms, wherein the merchants, as well ſtrangers as natives, tranſact moſt of their buſineſs.

The bazars or market-places are long covered narrow ſtreets, on each ſide of which are a great number of ſmall ſhops, juſt ſufficient to hold the tradeſman and his goods, the buyer being obliged to ſtand without. Each ſeparate branch of buſineſs has a particular bazar, which is locked up, as well as the ſtreets, an hour and a half after ſun-ſet: but the locks are of wood, though the doors are caſed with iron. The ſlaughter-houſes are in the ſuburbs, open to the fields. The tanners have a khan to work in near the river. To the ſouthward in the ſuburbs they burn lime; and a little beyond that there is a village where they make ropes and catgut. On the oppoſite ſide of the river, to the weſtward, there is a glaſs-houſe, where they make a coarſe white glaſs, in the winter only; for the greateſt part of this manufacture is brought from a village 35 miles weſtward.

The ſituation of Aleppo, beſide the advantage of a rich and fruitful ſoil, poſſeſſes alſo that of a ſtream of freſh water, which never becomes dry. This rivulet, which is about as large as that of the Gobelins at Paris, or the New River near London, riſes in the mountains of Aentab, and terminates ſix leagues below Aleppo, in a moraſs full of wild boars and pelicans. Near Aleppo, its banks, inſtead of the naked rocks which line them in the upper part of its courſe, are covered with a fertile earth, and laid out in gardens, or rather orchards, which, in a hot country, and eſpecially in Turkey, cannot but be delightful. The city is in itſelf one of the moſt agreeable in Syria, and is perhaps the cleaneſt and beſt built of any in Turkey, On whatever ſide it is approached, its numerous minarets and domes preſent an agreeable proſpect to the eye, fatigued with the continued ſameneſs of the brown and parched plains. In the centre is an artificial mountain ſurrounded by a dry ditch, on which is a ruinous fortreſs. From hence we have a fine proſpect of the whole city, and to the north diſcover the ſnowy tops of the mountains of Bailan; and on the weſt, thoſe which ſeparate the Orontes from the ſea; while to the ſouth and eaſt, the eye can diſcern as far as the Euphrates. In the time of Omar, this caſtle ſtopped the progreſs of the Arabs for ſeveral months, and was at laſt taken by treachery, but at preſent would not be able to reſiſt the feebleſt aſſault. Its ſlight wall, low, and without a buttreſs, is in ruins; its little old towers are in no better condition; and it has not four cannon fit for ſervice, not excepting a culverine nine feet long, taken from the Perſians at the ſiege of Baſſora. Three hundred and fifty Janiſaries, who ſhould form the garriſon, are buſy in their ſhops, and the aga ſcarcely finds room in it to lodge his retinue. It is remarkable that this aga is named immediately by the Porte, which, ever ſuſpicious, divides as much as poſſible the different offices. Within the walls of the caſtle is a well, which, by means of a ſubterraneous communication, derives its water from a ſpring a league and a quarter diſtant. In the environs of the city, we find a number of large ſquare ſtones, on the top of which is a turban of ſtone, which are ſo many tombs. There are many riſing grounds round it, which, in caſe of a ſiege, would greatly facilitate the approaches of the aſſailants. Such, among others, is that on which the houſe of the Derviches ſtands, and which commands the canal and the rivulet: Aleppo, therefore, cannot be eſteemed a place of importance in war, though it be the key of Syria to the north; but, conſidered as a commercial city, it has a different appearance. It is the emporium of Armenia and the Diarbekar; ſends caravans to Bagdad and into Perſia; and communicates with the Perſian gulph and India, by Baſſora, with Egypt and Mecca by Damaſcus, and with Europe by Skandaroon (Alexandretta) and Latakia. Commerce is there principally carried on by barter. The chief commodities are raw or ſpun cottons, clumſy linens fabricated in the villages; ſilk ſtuffs manufactured in the city, copper, *bourres* (coarſe cloths) like thoſe of Rouen, goats hair brought from Natolia; the gall nuts of the Kourdeſtan, the merchandiſe of India, ſuch as ſhawls and muſlins, and piſtachio nuts of the growth of the neighbourhood. The articles ſupplied by Europe are the Languedoc cloths, cochineal, indigo, ſugar, and ſome other groceries. The coffee of America, though prohibited, is introduced, and ſerves to mix with that of Moka. The French have at Aleppo a conſul and ſeven counting-houſes; the Engliſh and the Venetians two, and the merchants of Leghorn and Holland one. The emperor appointed a conſul there in 1784, in the perſon of a rich Jew merchant, who ſhaved his beard to aſſume the uniform and the ſword. Ruſſia has alſo ſent one very lately. Aleppo is not exceeded in extent by any city in Turkey, except Conſtantinople and Cairo, and perhaps Smyrna. The number of inhabitants has been computed at 200,000; but in theſe calculations certainty is impoſſible. However, if we obſerve that this city is not larger than Nantes or Marſeilles, and that the houſes conſiſt only of one ſtory, we ſhall perhaps not think it probable they exceed 100,000. The people of this city, both Turks and Chriſtians, are with reaſon eſteemed the moſt civilized in all Turkey; and the European merchants no where enjoy ſo much liberty, or are treated with ſo much reſpect.

The air of Aleppo is very dry and piercing, but at the ſame time very ſalubrious for all who are not troubled with aſthmatic complaints. The city, however, and the environs, are ſubject to a ſingular endemial diſorder, which is called the ringworm or pimple of Aleppo; it is in fact a pimple which is at firſt inflammatory, and at length becomes an ulcer of the ſize of the nail. The uſual duration of this ulcer is one year;

it

Aleppo. it commonly fixes on the face, and leaves a fcar which disfigures almoft all the inhabitants. It is alleged that every ftranger who refides there three months is attacked with it; experience has taught that the beft mode of treatment is to make ufe of no remedy. No reafon is affigned for this malady: but M. Volney fufpects it proceeds from the quality of the water, as it is likewife frequent in the neighbouring villages, in fome parts of the Diarbekar, and even in certain diftricts near Damafcus, where the foil and the water have the fame appearances. Of the Chriftian inhabitants the greater number are Greeks, next to them the Armenians, then the Syrians, and laftly the Maronites; each of whom have a church in the city called *Judida*; in which quarter, and the parts adjacent, moft of them refide. The common language is the vulgar Arabic, but the Turks of condition ufe the Turkifh. Moft of the Armenians can fpeak the Armenian, fome few Syrians underftand Syriac, and many of the Jews Hebrew; but fcarce one of the Greeks underftand a word of Greek. The people in general are of a middle ftature, and tolerably well proportioned; but they feem neither vigorous nor active. Both fexes are handfome when young: but the beard foon disfigures the men: and the women, as they come early to maturity, alfo fade very foon; females are generally married from 14 to 18 years of age, and many under 14. The people of rank here are polite and affable, making allowances for that fuperiority which the Mahometan religion inftructs its votaries to affume over all who hold a different faith. Their bread is generally of wheat flour made into thin cakes, but very ill prepared, and is generally eaten as foon as it comes out of the oven. The principal people have fmall loaves of a finer flour, which are well fermented and baked. Befides thefe, there are a variety of bifcuits, moft of which are ftrewed on the top with fome kind of feeds. The Europeans have very good bread, baked and prepared in the French manner. All the inhabitants of both fexes fmoke tobacco to great excefs; even the very fervants have almoft conftantly a pipe in their mouths. Coaches or carriages are not ufed here; therefore perfons of quality ride on horfeback in the city, with a number of fervants walking before them, according to their rank: ladies of the firft diftinction are even compelled to walk on foot in the city, or to any place at a moderate diftance; in longer journeys they are carried by mules, in a kind of a couch clofe covered up. There are a number of public bagnios in this city, which are ufed by people of all ranks, except thofe of the higheft diftinction, who commonly have baths and every other convenience in their own houfes. Aleppo is 70 miles eaft of Scandaroon, on the fea-coaft, and 175 north-by-eaft of Damafcus. E. long. 37. 40. N. lat. 36. 12.

Aleppo (*the Pachalic of*), one of the five governments into which Syria is divided. It comprehends the country extending from the Euphrates to the Mediterranean, between two lines, one drawn from Scandaroon to Beer, along the mountains; the other from Beles to the fea, by Mara and the bridge of Shoger. This fpace principally confifts of two plains; that of Antioch to the weft, and that of Aleppo to the eaft: the north and the fea coaft are occupied by confiderably high mountains, known to the ancients by the names of Amanus and of Rhofus. In general, the foil of this government is fat and loamy. The lofty and vigorous plants which fhoot up every where after the winter rains prove its fertility, but its actual fruitfulnefs is but little. The greateft part of the lands lie wafte; fcarcely can we trace any marks of cultivation in the environs of the towns and villages. Its principal produce confifts in wheat, barley, and cotton, which are found efpecially in the flat country. In the mountains, they rather choofe to cultivate the vine, mulberry, olive, and fig trees. The fides of the hills towards the fea-coaft are appropriated to tobacco, and the territory of Aleppo to piftachios. The pafturage is not to be reckoned, becaufe that is abandoned to the wandering hordes of the Turkmen and Curds.

In the greater part of the pachalics the pacha is, as his title imports, at once the viceroy and farmer-general of the country; but in that of Aleppo he does not poffefs the latter office. This the Porte has beftowed on a *mehaffel* or collector, who is immediately accountable for what he receives. His leafe is only for a year. The prefent rent of his farm is 800 purfes (above L.40,000); but to this muft be added the price of the *babouches* (Turkifh flippers), or a prefent of three or four thoufand pounds, to purchafe the favour of the vifir and men in office. For thefe two fums the farmer receives all the duties of the government; which are, firft, The produce of import and export duties on merchandife coming from Europe, India, and Conftantinople, and on that exported in exchange. Secondly, The taxes paid by the herds of cattle brought every year by the Turkmen and Curds from Armenia and the Diarbekar, to be fold in Syria. Thirdly, The fifth of the falt-works of Djeboul. And laftly, The miri, or land-tax. Thefe united may produce about L.60,000.

The pacha, deprived of this lucrative branch of the adminiftration, receives a fixed allowance of about L.8300. This revenue has always been inadequate to the expences; for, befides the troops he is obliged to maintain, and the reparation of the highways and fortreffes, the expences of which he is obliged to defray, he is under the neceffity of making large prefents to the minifters, in order to keep his place; but the Porte adds to the account the contributions he may levy on the Curds and Turkmen, and his extortions from the villages and individuals; nor do the pachas come fhort of this calculation. Abdi Pacha, who governed 13 or 14 years ago, carried off, at the end of 15 months, upwards of L.160,000, by laying under contribution every trade, even the very cleaners of tobacco-pipes; and very lately another of the fame name has been obliged to fly for fimilar oppreffions. The former was rewarded by the divan with the command of an army againft the Ruffians; but if the latter has not enriched himfelf, he will be ftrangled as an extortioner. Such is the ordinary progrefs of affairs in Turkey!

In confequence of fuch wretched government, the greater part of the pachalics in the empire are impoverifhed and laid wafte. This is the cafe in particular with that of Aleppo. In the ancient *deftars*, or regifters of impofts, upwards of 3200 villages were reckoned; but at prefent the collector can fcarcely find 400. Such of our merchants as have refided there 20 years, have themfelves feen the greater part of the environs

environs of Aleppo become depopulated. The traveller meets with nothing but houses in ruins, cisterns rendered useless, and fields abandoned. Those who cultivated them are fled into the towns, where the population is absorbed, but where at least the individual conceals himself among the crowd from the rapacious hand of despotism.

ALERIA, ALALIA, or ALARIA, (anc. geog.), a town of Corsica, situated near the middle of the east side of the island, on an eminence, near the mouth of the river Rotanus mentioned by Ptolemy; built by the Phocæans (Diodorus Siculus.) Afterwards Sylla led a colony thither. It is now in ruins, and called *Aleria Distrutta.*

ALES (Alexander), a celebrated divine of the confession of Augsbourg, born at Edinburgh the 23d of April 1500. He soon made a considerable progress in school-divinity, and entered the lists very early against Luther, this being then the great controversy in fashion, and the grand field wherein all authors young and old used to display their abilities. Soon after, he had a share in the dispute which Patrick Hamilton maintained against the ecclesiastics, in favour of the new faith he had imbibed at Marpurgh. He endeavoured to bring him back to the Catholic religion; but this he could not effect, and even began himself to doubt about his own religion, being much affected by the discourse of this gentleman, and still more by the constancy he showed at the stake, where David Beton archbishop of St Andrew's caused him to be burnt. Beginning thus to waver, he was himself persecuted with so much violence, that he was obliged to retire into Germany, where he became at length a perfect convert to the Protestant religion. The change of religion which happened in England after the marriage of Henry VIII. with Anna Bullen, induced Ales to go to London in 1535. He was highly esteemed by Cranmer archbishop of Canterbury, Latimer, and Thomas Cromwel, who were at that time in high favour with the king. Upon the fall of these favourites, he was obliged to return to Germany; where the elector of Brandenburgh appointed him professor of divinity at Francfort upon the Oder, in 1540. But leaving this place upon some disgust, he returned to Leipsic, where he was chosen professor of divinity, and died in March 1565. He wrote a Commentary on St John, on the Epistles to Timothy, and on the Psalms, &c.

ALESA, ALÆSA, or HALESA, (anc. geog.), a town of Sicily, on the Tuscan sea, built, according to Diodorus Siculus, by Archonides of Herbita, in the second year of the 94th Olympiad, or 403 years before Christ; situated on an eminence about a mile from the sea: now in ruins. It enjoyed immunity from taxes under the Romans (Diodorus, Cicero). The inhabitants were called *Halesini* (Cicero, Pliny); also *Alesini*, and *Alæsini.*

ALESHAM, a small neat town in Norfolk. It is 15 miles N. of Norwich, and 121 N. E. by N. of London. E. Long. 0. 30. N. Lat. 52. 53. The town consists of about 400 pretty good houses; but the streets are narrow, though well paved.

ALESIA, (anc. geog.) called *Alexia* by Livy and others; a town of the Mandubii, a people of Celtic Gaul; situated, according to Cæsar, on a very high hill, whose foot was washed on two sides by two rivers. The town was of such antiquity, that Diodorus Siculus relates it was built by Hercules. It is supposed to be the city of *Alise*, in the duchy of Burgundy, not far from Dijon.

ALET, a town of France, in Lower Languedoc, with a bishop's see. It is remarkable for its baths, and for the grains of gold and silver found in the stream which runs from the Pyrenean mountains, at the foot of which it stands. It is seated on the river Aude, 15 miles S. of Carcassone, and 37 N. W. of Narbonne. E. Long. 2. 5. N. Lat. 42. 59.

ALETRIS, in botany, a genus of the monogynia order, belonging to the hexandria class of plants, and in the natural method ranking under the 10th order, *Coronariæ.* The characters are: The *corolla* is monopetalous, funnel-shaped, hexangular, much corrugated, semiquinquefid, and persistent: The *stamina* consist of six subulated filaments, the length of the corolla, and inserted into the base of the divisions of the corolla; the antheræ are oblong and erect: The *pistillum* has an ovate germen; the stylus subulated, and the length of the stamina; the stigma is trifid: The *pericarpium* is an ovated capsule, triquetrous, pointed, and triocular: The *seeds* are numerous. Of this genus botanical writers enumerate five

Species. 1. The farinosa, a native of Virginia, and other parts of North America. 2. The capensis, a native of the Cape of Good Hope. 3. The hyacinthoides, or Guinea aloe. 4. The zeylanica, or Ceylon aloe. 5. The fragrans, or tree-aloe, a native of Africa. Of these only the first is so hardy as to outlive the winter in Britain, unless placed in a stove; and even this requires to be sheltered under a frame. The flowers appear in June or July, of a whitish green colour. The third and fifth produce fine spikes of white flowers; those of the third kind appearing in July, of the fifth in March or April. By proper management the last kind becomes a stately plant, rising to the height of 12 or 14 feet; the flowers open wide in the evening, and perfume the air of the stove. These send out one or two heads, or tufts, towards their tops, which may be cut off; and after they have lain a week in the stove to heal the wounded parts, they may be planted for increase. The other species seldom or never flower in this country, nor does their appearance otherwise merit notice.

ALETUM, or ALETA, (anc. geog.) a town of Celtic Gaul, now extinct. From its ruins arose St Malo, in Brittany, at the distance of a mile. Its ruins are called *Guich Aleth* in the British.

ALEUROMANCY, the same with what was otherwise called *alphitomantia*, and *crithomanthia*, and means an ancient kind of divination performed by means of meal or flower.

ALEXANDER THE GREAT, king of Macedonia. His father Philip laid the plan of that extensive empire, which his son afterwards executed.—Philip, having made himself master of Greece, began to cast his eyes upon Persia, with a view to retaliate upon that haughty empire the injuries of former times. It was the popular topic of the day. But this prince was cut off in the midst of his enterprise. Such, however, was the influence of Alexander in the assembly of the Grecian states, that he was created general of their combined forces in the room of his father. Having made every

needful preparation, at the head of a veteran army he invaded Asia. The lieutenants of Darius, who was then king of Persia, opposed him at the river Granicus, where Alexander obtained a complete victory, after which he pursued his march through Asia. At Issus, near Scanderoon, he was met by Darius in person, at the head of a prodigious army. Here he obtained a second victory; and took the camp of Darius, together with his family, whom he treated with the utmost humanity. Contrary to all the maxims of war, instead of pursuing Darius, he made an excursion into Egypt; and, as far as appears, through no better motives than those of vanity. Here he was acknowledged to be the son of Jupiter Ammon. In the mean time Darius recruited his strength, and got together an army superior to what he brought into the plain of Issus. Alexander having finished his Egyptian expedition, traversed Asia, and passed the Euphrates. At Arbella, a town in Assyria, he met Darius. Here a decisive battle was fought, which put all Persia into the hands of Alexander. His ambition not being satisfied with the conquest of that vast country, he projected an expedition into India. Here he met with great opposition from Porus, a gallant prince, whom in the end he reduced. Beyond the Ganges lay a country still unsubdued. He notified it to his army, that he proposed to pass the river. But these veterans, harrassed with the fatigues, and seeing no end of their labour, mutinied, and refused to march further. The disappointed chief was therefore obliged to return. At Babylon he proposed to receive ambassadors, appoint governors, and settle his vast monarchy; but his excesses put an end to his life in the midst of his designs, and in the flower of his age.

The character of this hero is so familiar to every body, that it is almost needless labour to draw it. All the world knows, says Mr Bayle, that it was equally composed of very great virtues and very great vices. He had no mediocrity in any thing but his stature: in his other properties, whether good or bad, he was all extremes. His ambition rose even to madness. His father was not at all mistaken in supposing the bounds of Macedon too small for his son: for how could Macedon bound the ambition of a man, who reckoned the whole world too small a dominion? He wept at hearing the philosopher Anaxarchus say, that there was an infinite number of worlds: his tears were owing to his despair of conquering them all, since he had not yet been able to conquer one. Livy, in a short digression, has attempted to enquire into the events which might have happened, if Alexander, after the conquest of Asia, had brought his arms into Italy? Doubtless things might have taken a very different turn with him; and all the grand projects, which succeeded so well against an effeminate Persian monarch, might easily have miscarried if he had to do with rough hardy Roman armies. And yet the vast aims of this mighty conqueror, if seen under another point of view, may appear to have been confined in a very narrow compass; since, as we are told, the utmost wish of that great heart, for which the whole earth was not big enough, was, after all, to be praised by the Athenians: for it is related, that the difficulties which he encountered in order to pass the Hydaspes, forced him to cry out, "O Athenians, could you believe to what dangers I "expose myself for the sake of being celebrated by "you?" But Bayle affirms, that this was quite consistent with the vast unbounded extent of his ambition, as he wanted to make all future time his own, and be an object of admiration to the latest posterity; yet did not expect this from the conquest of worlds, but from books. He was perfectly in the right, says Bayle; "for if Greece had not furnished him with good writers, he would long ago have been as much forgotten as the kings who reigned in Macedon before Amphitryon."

Alexander has been praised upon the score of continency, yet his life could not surely be quite regular in that respect. Indeed, the fire of his early youth appeared so cold towards women, that his mother suspected him to be impotent; and, to satisfy herself in this point, did, with the consent of Philip, procure a very handsome courtezan to lie with him, whose caresses, however, were all to no purpose. His behaviour afterwards to the Persian captives shows him to have had a great command over himself in this particular. The wife of Darius was a finished beauty; her daughters likewise were all beauties; yet this yonng prince, who had them in his power, not only bestowed on them all the honours due to their high rank, but managed their reputation with the utmost delicacy. They were kept as in a cloyster concealed from the world, and secured from the reach of every dishonourable (not only attack, but) imputation. He did not give the least handle to scandal, either by his visits, his looks, or his words: and for other Persian dames his prisoners, equally beautiful in face and shape, he contented himself with saying gaily, that they gave indeed much pain to his eyes. The amazon Thalestris could not obtain from him a compliance with her gallant request till after a delay of thirteen days. In the mean time, what are we to conclude from his causing his favourite mistress Pancaste to be drawn naked by Apelles, tho' it is true he gave her to the painter, who fell in love with her? What of that immoderate love of boys, which Athenæus relates of him? What of that prodigious number of wives and concubines which he kept?

His excesses with regard to wine were notorious, and beyond all imagination; and he committed, when drunk, a thousand extravagancies. It was owing to wine, that he killed Clytus who saved his life, and burnt Persepolis, one of the most beautiful cities of the East: he did this last indeed at the instigation of the courtezan Thais; but this circumstance made it only the more heinous. It is generally believed, that he died by drinking immoderately: and even Plutarch, who affects to contradict it, owns that he did nothing but drink the whole day he was taken ill.

In short, to sum up the character of this prince, we cannot be of opinion, that his good qualities did in any wise compensate for his bad ones. Heroes make a noise: their actions glare, and strike the senses forcibly; while the infinite destruction and misery they occasion lies more in the shade, and out of sight. One good legislator is worth all the heroes that ever did or will exist. See MACEDON.

ALEXANDER AB ALEXANDRO, a Neapolitan lawyer, of great learning, who flourished toward the end of the 15th and beginning of the 16th century. He followed the profession of the law first at Naples, afterwards

 afterwards at Rome: but he devoted all the time he could ſpare to the ſtudy of polite literature; and at length he entirely left the bar, that he might lead a more eaſy and agreeable life with the muſes. The particulars of his life are to be gathered from his work intitled *Genialium Dierum:* We are there informed, that he lodged at Rome, in a houſe that was haunted; and he relates many ſurpriſing particulars about the ghoſt: he ſays alſo, that when he was very young, he went to the lectures of Philelphus, who explained at Rome the Tuſculan queſtions of Cicero; he was there alſo when Nicholas Perot and Domitius Calderinus read their lectures upon Martial. The particular time when he died is not known; but he was buried in the monaſtery of the Olivets. Tiraquea wrote a learned commentary upon his work, which was printed at Lyons in 1587, and reprinted at Leyden in 1673, with the notes of Dennis Godfrey, Chriſtopher Colerus, and Nicholas Mercerus.

ALEXANDER (Neckham), an eminent Engliſh writer in the 12th and 13th centuries, born at St Albans in Hertfordſhire. In 1215 he was made abbot of Exeter, and died in 1227. He wrote ſeveral works, which were never publiſhed; but they are to be found in manuſcript in the libraries of England and other countries.

ALEXANDER (Noel) an indefatigable writer of the 17th century, born at Roan in Normandy, 1639. After finiſhing his ſtudies at Roan, he entered into the order of Dominican friars, and was profeſſed there in 1655. Soon after he went to Paris, to go through a courſe of philoſophy and divinity in the great convent, where he diſtinguiſhed himſelf ſo, that he was appointed to teach philoſophy there, which he did for 12 years. Mr Colbert ſhowed him many marks of his eſteem; and being determined to omit nothing to perfect the education of his ſon, afterwards archbiſhop of Roan, he formed an aſſemly of the moſt learned perſons, whoſe conferences upon eccleſiaſtical hiſtory might be of advantage to him. Father Alexander was invited to this aſſembly, where he exerted himſelf with ſo much genius and ability, that he gained the particular friendſhip of young Colbert, who ſhowed him the utmoſt regard as long as he lived. Theſe conferences gave riſe to Alexander's deſign of writing an eccleſiaſtical hiſtory; for, being deſired to reduce what was material in theſe conferences to writing, he did it with ſo much accuracy, that the learned men who compoſed this aſſembly, adviſed him to undertake a complete body of church-hiſtory. This he executed with great aſſiduity, collecting and digeſting the materials himſelf, and writing even the tables with his own hand. He at laſt completed his work in 1686. Towards the latter part of his life, he was afflicted with the loſs of his ſight; a moſt inexpreſſible misfortune to one whoſe whole pleaſure was in ſtudy, yet he bore it with great patience and reſignation. He died merely of a decay of nature, 1724, in the 86th year of his age.

ALEXANDER SEVERUS, emperor of Rome, ſucceeded Heliogabalus about A. D. 222, when but 16 years of age. His mother's name was Mammæa, and by her advice he in a great meaſure regulated his conduct. He applied himſelf to the reformation of abuſes, the ſtate having been greatly diſordered by the vicious conduct of his predeceſſor; he was a moſt ſtrict lover of juſtice, an encourager of learning and learned men, and favourable to the Chriſtians. He made a ſucceſsful expedition againſt the Perſians; but endeavouring to reform his troops, which had grown very licentious under the late bad government, they murdered him at the inſtigation of Maximinus in the 29th year of his age, together with his mother, A. D. 235.

ALEXANDER VI. (Pope), had four baſtards when he was cardinal, for one of which he had ſo great affection, that he ſtuck at nothing to raiſe him. Deſigning to poiſon ſome cardinals, he was poiſoned himſelf, A. D. 1503. See BORGIA.

ALEXANDER VII. (Pope). See CHIGI.

ALEXANDER Biſhop of Lincoln in the reigns of Henry I. and Stephen, was a Norman by birth, and nephew of the famous Roger, biſhop of Saliſbury, who firſt made him archdeacon of Saliſbury, and afterwards, by his intereſt with the king, raiſed him to the mitre. Alexander was conſecrated at Canterbury, July 22. 1123. Having received his education under his uncle the biſhop of Saliſbury, and been accuſtomed to a ſplendid way of living, he affected ſhow and ſtate more than was ſuitable to his character, or conſiſtent with his fortunes. This failing excepted, he was a man of worth and honour, and every way qualified for his ſtation. The year after his conſecration, his cathedral church at Lincoln having been accidentally burnt down, he rebuilt it, and ſecured it againſt the like accident for the future by a ſtone roof. This prelate increaſed the number of prebends in his church, and augmented its revenues with ſeveral manors and eſtates. In imitation of the barons and ſome of the biſhops, particularly his uncle the biſhop of Saliſbury, he built three caſtles; one at Banbury, another at Sleaford, and a third at Newark. He likewiſe founded two monaſteries; one at Haverholm, for regular canons and nuns together, the other at Tame for white-friars. He went twice to Rome in the years 1142 and 1144. The firſt time, he came back in quality of the pope's legate, for the calling a ſynod, in which he publiſhed ſeveral wholeſome and neceſſary canons. In Auguſt 1147, he took a third journey to the pope, who was then in France; where he fell ſick through the exceſſive heat of the weather, and returning with great difficulty to England, he died in the 24th year of his prelacy.

ALEXANDER (William), earl of Stirling, an eminent Scots ſtateſman and poet in the reigns of James I. and Charles I. who, after travelling with the duke of Argyle as his tutor or companion, wrote a poetical complaint of his unſucceſsful love of ſome beauty, under the title of *Aurora.* He then removed to the court of James VI. where he applied to the more ſolid parts of poetry, forming himſelf upon the plan of the Greek and Roman tragedians. In 1607, he publiſhed ſome dramatic performances, intitled *The Monarchic Tragedies,* dedicated to king James; who was ſo well pleaſed with them, as to call him his philoſophical poet. After this, he is ſaid to have written *A ſupplement* to complete the third part of Sir Philip Sidney's Arcadia; and in 1613, he produced a poem called *Doomſday, or the Great Day of Judgment.* He was made gentleman-uſher to prince Charles, and maſter of the requeſts; was knighted; and obtained a grant of Nova Scotia, where he projected the ſettlement of a colony, but afterward ſold it to the French. In 1626, he was made ſecretary of ſtate for

 Scotland;

Scotland; was created first viscount, and then earl, of Stirling; and died in 1640.

ALEXANDER I. (St), whom St Ireneus reckons the fifth bishop of Rome, succeeded St Evaristus in the year 109, and died in the year 119. There is no account of his life; and the epistles which are attributed to him are suppositious.

ALEXANDER II. king of Scotland, succeeded his father William in 1213, at 16 years of age. He made an expedition into England, to oppose the tyranny of king John; who returned the visit, and was offered battle by Alexander, but refused it. He took the city of Carlisle from Henry III. which was afterwards exchanged for Berwick. Alexander died in 1249, in the 51st year of his age, and 35th of his reign; and left for his successor, his son——

ALEXANDER III. who was crowned king of Scotland in 1249. The Cummings, lords of Scotland, took arms against him; and taking him prisoner, confined him at Striveling: but he was afterwards released by his subjects. He married the daughter of Henry III. king of England; and was at length killed by a fall from his horse, on the 10th of April 1290, after having reigned 42, or according to others 37, years.

ALEXANDERS, in botany. See SMYRNIUM.

ALEXANDREA, (anc. geog.) a mountain of Mysia, on the sea-coast, forming a part of mount Ida, where Paris gave judgment on the three goddesses.

ALEXANDRETTA, by the Turks called *Scanderoon;* a town in Syria, at the extremity of the Mediterranean sea. It is the port of Aleppo, from which it is distant 28 or 30 leagues. It is now, properly speaking, nothing else but a village, without walls, in which the tombs are more numerous than the houses, and which entirely owes its existence to the road which it commands. This is the only road, in all Syria, where vessels anchor on a solid bottom, without their cables being liable to chafe: but in other respects it has many inconveniences. It is infested, during winter, by a peculiar wind, called by the French sailors *le Raguier*, which, rushing from the snowy summits of the mountains, frequently forces ships to drag their anchors several leagues: And when the snow begins to cover the mountains which surround the Gulph, tempestuous winds arise which prevent vessels from entering for three or four months together. The road also to Aleppo by the plain is infested by Curd robbers, who conceal themselves in the neighbouring rocks, and frequently attack and plunder the strongest caravans. But the worst circumstance is the extreme unwholesomeness of the air, occasioned here by stagnant waters and mephitic exhalations. It may be affirmed, that this every year carries off one-third of the crews of the vessels which remain here during the summer; nay, ships frequently lose all their men in two months. The season for this epidemic disorder is principally from May to the end of September: it is an intermitting fever of the most malignant kind; and is accompanied with obstructions of the liver, which terminate in a dropsy. To this baneful epidemic, Alexandretta, from its situation, seems to be irremediably condemned: for the plain on which the town is built is so low and flat, that the rivulets, finding no declivity, can never reach the sea. When they are swelled by the winter rains, the sea, swelled likewise by tempests, hinders their discharging themselves into it: hence their waters, forced to spread themselves, form lakes in the plain. On the approach of the summer, the waters becoming corrupted by the heat, exhale vapours equally corrupt, and which cannot disperse, being confined by the mountains that encircle the gulph. The entrance of the bay besides lies to the west, which in those countries is the most unhealthy exposure when it corresponds with the sea. The labour necessary to remedy this would be immense, and after all insufficient; and, indeed, such an undertaking would be absolutely impossible under a government like that of the Turks. A few years ago, Mr Volney informs us, the merchants of Aleppo, disgusted with the numerous inconveniences of Alexandretta, wished to abandon that port and carry the trade to Latakia. They proposed to the Pacha of Tripoli to repair the harbour at their own expence, provided he would grant them an exemption from all duties for ten years. To induce him to comply with their request, the agent they employed talked much of the advantage which would, *in time*, result to the whole country: "But what signifies it to me what may happen *in time*, replied the Pacha? I was yesterday at Marach; tomorrow, perhaps, I shall be at Djedda: Why should I deprive myself of present advantages, which are certain, for future benefits I cannot hope to partake?" The European factors were obliged therefore to remain at Skandaroon. There are three of these factors, two for the French, and one for the English and Venetians. The only curiosity which they have to amuse strangers with consists in six or seven marble monuments, sent from England, on which you read: *Here lies such a one, carried off in the flower of his age, by the fatal effects of a contagious air.* The sight of these is the more distressing, as the languid air, yellow complexion, livid eyes, and dropsical bellies of those who show them, make it but too probable they cannot long escape the same fate. It is true, they have some resource in the village of Bailan, the pure air and excellent waters of which surprizingly restore the sick. The Aga, for some years past, has applied the duties of the customhouse of Alexandretta to his own use, and rendered himself almost independent of the Pacha of Aleppo. The Turkish empire is full of such rebels, who frequently die in peaceable possession of their usurpations.

ALEXANDRIA, now *Scanderia*, by Athenæus called Ῥακῶτις; a city of Lower Egypt, and for a long time its capital. This city was built by Alexander the Great, soon after the overthrow of Tyre, about 333 years before Christ. It is situated on the Mediterranean, twelve miles west of that mouth of the Nile anciently called *Canopicum;* and lies in E. Long. 30. 19. N. Lat. 31. 10.

Alexander is said to have been induced to build this city, on account of its being conveniently situated for a fine port; and so sudden was his resolution, that after he had directed where every public structure was to be placed, fixed the number of temples, and the deities to whom they should be dedicated, &c. there were no instruments at hand proper for marking out the walls, according to the custom of those times. Upon this, a workman advised the king to collect what meal was among the soldiers, and to sift it in lines upon the ground, whereby the circuit of the walls would be sufficiently marked out. This advice was followed; and

and the new method of marking out the walls was, by Ariftander, the king's foothfayer, interpreted as a prefage of the city's abounding with all the neceffaries of life. Nor was he deceived in his prediction; for Alexandria foon became the ftaple, not only for merchandife, but alfo for all the arts and fciences of the Greeks.

Alexandria was a league and a half long, by one-third in breadth, which made the circumference of its walls about four leagues. Lake Mareotis bathed its walls on the fouth, and the Mediterranean on the north. It was interfected lengthwife by ftraight parallel ftreets. This direction left a free paffage to the northerly wind, which alone conveys coolnefs and falubrity into Egypt. A ftreet of 2000 feet wide began at the gate of the fea, and terminated at the gate of Canopus. It was decorated by magnificent houfes, by temples, and by public buildings. In this extenfive range, the eye was never tired with admiring the marble, the porphyry, and the obelifks, which were deftined at fome future day to embellifh Rome and Conftantinople. This ftreet, the handfomeft in the univerfe, was interfected by another of the fame breadth, which formed a fquare at their junction of half a league in circumference. From the middle of this great place, the two gates were to be feen at once, and veffels arriving under full fail from the north and from the fouth.

A mole of a mile in length ftretched from the continent to the ifle of Pharos, and divided the great harbour into two. That which is to the northward preferved its name. A dyke drawn from the ifland to the rock whereon was built the Pharos, fecured it from the wefterly winds. The other was called *Eunoftos*, or the Safe Return. The former is called at prefent the new, the latter the old harbour: a bridge that joins the mole to the city, ferved for a communication between them. It was raifed on lofty pillars funk into the fea, and left a free paffage for fhips. The palace, which advanced beyond the promontory of *Lochias*, extended as far as the dyke, and occupied more than a quarter of the city. Each of the Ptolemies added to its magnificence. It contained within its inclofure, the mufeum, an afylum for learned men, groves, and buildings worthy of royal majefty, and a temple where the body of Alexander was depofited in a golden coffin. The infamous Seleucus Cibyofactes violated this monument, carried off the golden coffin, and put a glafs one in its place. In the great harbour was the little ifland of Anti-Rhodes, where ftood a theatre, and a royal place of refidence. Within the harbour of Eunoftos was a fmaller one, called Kibotos, dug by the hand of man, which communicated with Lake Mareotis by a canal. Between this canal and the palace was the admirable temple of Serapis, and that of Neptune near the great place where the market was held. Alexandria extended likewife along the fouthern banks of the lake. Its eaftern part prefented to view the gymnafium, with its porticoes of more than 600 feet long, fupported by feveral rows of marble pillars. Without the gate of Canopus was a fpacious circus for the chariot races. Beyond that, the fuburb of Nicopolis ran along the feafhore, and feemed a fecond Alexandria. A fuperb amphitheatre was built there with a race-ground, for the celebration of the quinquennalia.

Such is the defcription left us of Alexandria by the ancients, and above all by Strabo.

The architect employed by Alexander in this undertaking was the celebrated Dinocrates, who had acquired fo much reputation by rebuilding the temple of Diana at Ephefus. The city was firft rendered populous by Ptolemy Soter, one of Alexander's captains, who, after the death of the Macedonian monarch, being appointed governor of Egypt, foon affumed the title of king, and took up his refidence at Alexandria, about 304 years before Chrift.

In the 30th year of Ptolemy Soter's reign, he took his fon Ptolemy Philadelphus partner with him in the empire; and by this prince the city of Alexandria was much embellifhed. In the firft year of his reign the famous watch-tower of Pharos was finifhed. It had been begun feveral years before by Ptolemy Soter; and, when finifhed, was looked upon as one of the wonders of the world. The fame year, the ifland of Pharos itfelf, originally feven furlongs diftant from the continent, was joined to it by a caufeway. This was the work of Dexiphanes, who completed it at the fame time that his fon put the laft hand to the tower. The tower was a large fquare ftructure of white marble; on the top of which fires were kept conftantly burning, for the direction of failors. The building coft 800 talents; which, if Attic, amounted to L. 165,000; if Alexandrian, to twice that fum.

The architect employed in this famous ftructure fell upon the following contrivance to ufurp the whole glory to himfelf.—Being ordered to engrave upon it the following infcription, "King PTOLEMY to the Gods the Saviours, for the benefit of Sailors;" inftead of the king's name he fubftituted his own, and then filling up the hollow of the marble with mortar, wrote upon it the above mentioned infcription. In procefs of time, the mortar being wore off, the following infcription appeared: "SOSTRATUS the CNIDIAN, the fon of DEXIPHANES, to the Gods the Saviours, for the benefit of Sailors."

This year alfo was remarkable for the bringing of the image of Serapis from Pontus to Alexandria. It was fet up in one of the fuburbs of the city called *Rhacotis*, where a temple was afterwards erected to his honour, fuitable to the greatnefs of that ftately metropolis, and called, from the god worfhipped there, *Serapeum*. This ftructure, according to Ammianus Marcellinus, furpaffed in beauty and magnificence all others in the world, except the capitol at Rome.—Within the verge of this temple was the famous Alexandrian library. It was founded by Ptolemy Soter, for the ufe of an academy he inftituted in this city; and, by continual additions by his fucceffors, became at laft the fineft library in the world, containing no fewer than 700,000 volumes. The method followed in collecting books for this library, was, to feize all thofe which were brought into Egypt by Greeks or other foreigners. The books were tranfcribed in the mufeum by perfons appointed for that purpofe; the copies were then delivered to the proprietors, and the originals laid up in the library. Ptolemy Euergetes, having borrowed from the Athenians the works of Sophocles, Euripides, and Æfchylus, returned them only the copies, which he caufed to be tranfcribed in as beautiful a manner as poffible; prefenting the Athenians at the fame time with fifteen talents (upwards of L. 3000 Sterling) for the exchange.

As the museum was at first in that quarter of the city called *Bruchion*, near the royal palace, the library was placed there likewise; but when it came to contain 400,000 volumes, another library, within the Serapeum, was erected by way of supplement to it, and on that account called the *daughter* of the former. In this second library 300,000 volumes, in process of time, were deposited; and the two together contained the 700,000 volumes already mentioned. In the war carried on by Julius Cæsar against the inhabitants of this city, the library in the Bruchion, with the 400,000 volumes it contained, was reduced to ashes. The library in the Serapeum, however, still remained; and here Cleopatra deposited 200,000 volumes of the Pergamean library, which Marc Antony presented her with. These, and others added from time to time, rendered the new library at Alexandria more numerous and considerable than the former; and though it was often plundered during the revolutions and troubles of the Roman empire, yet it was again and again repaired, and filled with the same number of books.

For 293 years Alexandria was held in subjection by the Ptolemies. Here is a list of these princes, with the dates of their respective reigns.

Ptolemy the son of Lagus, surnamed *Soter*, reigned 39 years, and died in the year of the world 3720. Ptolemy Philadelphus reigned 39 years, and died in 3758. Ptolemy Euergetes reigned 25 years, and died in 3783. Ptolemy Philopator reigned 17 years, and died in 3800. Ptolemy Epiphanes reigned 24 years, and died in 3824. Ptolemy Philometor reigned 37 years, and died in 3861. Ptolemy Euergetes, or Physcon, reigned 53 years, part with his brother Philometer and part alone. He died in 3888. Ptolemy Lathyrus reigned 36 years six months. He died in 3923. Cleopatra, the daughter of Lathyrus and wife of Alexander I. reigned six months. Alexander I. the nephew of Lathyrus, was established in 3924 and died in 3943. Alexander II. the son of Alexander I. was dispossessed by the Alexandrians in 3939. Ptolemy Nothus, or Auletes, the son of Lathyrus, reigned 13 years, and died in 3953. Ptolemy, surnamed *Dionysius* or *Bacchus*, reigned three years eight months, and died in 3957. Cleopatra reigned from 3957, and killed herself in 3974.

This city, as we have already observed, soon became extremely populous, and was embellished both by its own princes and the Romans; but, like most other noted cities of antiquity, hath been the seat of terrible massacres. About 141 years before Christ, it was almost totally depopulated by Ptolemy Physcon. That barbarous monster, without the least provocation, gave free liberty to his guards to plunder his metropolis and murder the inhabitants at their pleasure. The cruelties practised on this occasion cannot be expressed; and the few who escaped were so terrified that they fled into other countries. Upon this, Physcon, that he might not reign over empty houses, invited thither strangers from the neighbouring countries; by whom the city was repeopled, and soon recovered its former splendor. On this occasion many learned men having been obliged to fly, proved the means of reviving learning in Greece, Asia Minor, the islands of the Archipelago, and other places, where it was almost totally lost.

The new inhabitants were not treated with much more kindness by Physcon than the old ones had been; for, on their complaining of his tyrannical behaviour, he resolved on a general massacre of the young men. Accordingly, when they were one day assembled in the gymnasium, or place of their public exercises, he ordered it to be set on fire; so that they all perished, either in the flames, or by the swords of his mercenaries, whom the tyrant had placed at all the avenues.

Though Julius Cæsar was obliged to carry on a war for some time against this city, it seems not to have suffered much damage, except the burning of the library already mentioned. Before Cæsar left Alexandria, in acknowledgment of the assistance he had received from the Jews, he confirmed all their privileges there, and even engraved his decree on a pillar of brass. This, however, did not prevent the massacre of 50,000 of them in this city about the year of Christ 67.

The city of Alexandria seems to have fallen into decay soon after this, and to have forfeited many of its ancient privileges, tho' for what offence is not known; but when Adrian visited Egypt, about the year 141, it was almost totally ruined. He repaired both the public and private buildings, not only restoring the inhabitants to their ancient privileges, but heaping new favours upon them; for which they returned him their solemn thanks, and conferred upon him what honours they could while he was present; but as soon as he was gone, they published the most bitter and virulent lampoons against him.

The fickle and satirical humour of the Alexandrians was highly disliked by Adrian, though he inflicted no punishment upon them for it; but when they lampooned Caracalla, he did not let them escape so easily. That tyrant, in the year 215, when he visited their city, having become the subject of their foolish satires, ordered a general massacre by his numerous troops, who were dispersed all over the city. The inhuman orders being given, all were murdered, without distinction of age or sex; so that in one night's time the whole city floated in blood, and every house was filled with carcases. The monster who occasioned this had retired during the night to the temple of Serapis, to implore the protection of that deity; and, not yet satiated with slaughter, commanded the massacre to be continued all the next day; so that very few of the inhabitants remained. As if even this had not been sufficient, he stripped the city of all its ancient privileges; suppressed the academy; ordered all strangers who lived there to depart; and that the few who remained might not have the satisfaction of seeing one another, he cut off all communication of one street with another, by walls built for that purpose, and guarded by troops left there.

Notwithstanding this terrible disaster, Alexandria soon recovered its former splendor, as Caracalla was murdered a short time after. It was long esteemed the first city in the world, next to Rome; and we may judge of its magnificence, and the multitude of people contained in it, from the account of Diodorus Siculus, who relates, that in his time (44 years before Christ) Alexandria had on its rolls 300,000 freemen. Towards the middle of the sixth century, Amrou *Ebn el Aas*, Omar's general, took it by storm, after a siege of

Alexandria. of 14 months, and with the loſs of 23,000 men. Heraclius, then emperor of Conſtantinople, did not ſend a ſingle ſhip to its aſſiſtance. This prince affords an example very rare in hiſtory; he had diſplayed ſome vigour in the firſt year of his reign, and then ſuffered himſelf to be lulled into idleneſs and effeminacy. Awakened ſuddenly from his lethargy by the noiſe of the conqueſts of Coſroes, that ſcourge of the eaſt, he put himſelf at the head of his armies, diſtinguiſhed himſelf as a great captain from his very firſt campaign, laid waſte Perſia for ſeven years, and returned to his capital covered with laurels: he then became a theologian on the throne, loſt all his energy, and amuſed himſelf the reſt of his life with diſputing upon Monotheiſm, whilſt the Arabs were robbing him of the fineſt provinces of his empire. Deaf to the cries of the unfortunate inhabitants of Alexandria, as he had been to thoſe of the people of Jeruſalem, who defended themſelves for two years, he left them a ſacrifice to the fortunate aſcendant of the indefatigable Amrou. All their intrepid youth periſhed with their arms in their hands.

The victor, aſtoniſhed at his conqueſt, wrote to the caliph, "I have taken the city of the weſt. It is of an immenſe extent. I cannot deſcribe to you how many wonders it contains. There are 4000 palaces, 4000 baths, 12,000 dealers in freſh oil, 12,000 gardeners, 40,000 Jews who pay tribute, 400 comedians," &c.

At this time, according to the Arabian hiſtorians, Alexandria conſiſted of three cities, *viz. Menna*, or the port, which included Pharos, and the neighbouring parts; *Alexandria*, properly ſo called, where the modern Scanderia now ſtands; and *Nekita*, probably the Necropolis of Joſephus and Strabo.

At that time John, ſurnamed *the grammarian*, a famous Peripatetic philoſopher, being in the city, and in high favour with Amrou Ebn al Aas the Saracen general begged of him the royal library. Amrou replied, that it was not in his power to grant ſuch a requeſt; but that he would write to the khalif on that head; ſince, without knowing his pleaſure, he dared not to diſpoſe of a ſingle book. He accordingly wrote to Omar, who was then khalif, acquainting him with the requeſt of his friend: To which the ignorant tyrant replied, That if thoſe books contained the ſame doctrine with the koran, they could be of no uſe, ſince the koran contained all neceſſary truths; but if they contained any thing contrary to that book, they ought not to be ſuffered; and therefore, whatever their contents were, he ordered them to be deſtroyed. Purſuant to this order, they were diſtributed among the public baths; where, for the ſpace of ſix months, they ſerved to ſupply the fires of thoſe places, of which there was an incredible number in Alexandria.

After the city was taken, Amrou thought proper to purſue the Greeks who had fled farther up the country; and therefore marched out of Alexandria, leaving but a very ſlender garriſon in the place. The Greeks, who had before fled on board their ſhips, being appriſed of this, returned on a ſudden, ſurpriſed the town, and put all the Arabs they found therein to the ſword: but Amrou, receiving advice of what had happened, ſuddenly returned, and drove them out of it with great ſlaughter; after which the Greeks were ſo intimidated, that he had nothing farther to fear from them.—A few years after, however, Amrou being deprived of his government by the khalif Othman, the Egyptians were ſo much diſpleaſed with his diſmiſſion that they inclined to a revolt; and Conſtantine the Greek emperor, having received intelligence of their diſaffection, began to meditate the reduction of Alexandria. For this purpoſe, he ſent one Manuel, an eunuch, and his general, with a powerful army, to retake that place; which, by the aſſiſtance of the Greeks in the city, who kept a ſecret correſpondence with the imperial forces while at ſea, and joined them as ſoon as they had made a deſcent, he effected, without any conſiderable effuſion of Chriſtian blood. The khalif, now perceiving his miſtake, immediately reſtored Amrou to his former dignity. This ſtep was very agreeable to the natives; who having had experience of the military ſkill and bravery of this renowned general, and apprehending that they ſhould be called to an account by the Greeks for their former perfidious conduct, had petitioned Othman to ſend him again into Egypt.—Upon Amrou's arrival, therefore, at Alexandria, the Copts or natives, with the traitor Al-Mokawkas (who had formerly betrayed to Amrou the fortreſs of Meſr) at their head, not only joined him, but ſupplied him with all kinds of proviſions, exciting him to attack the Greeks without delay. This he did; and, after a moſt obſtinate diſpute which laſted ſeveral days, drove them into the town, where, for ſome time, they defended themſelves with great bravery, and repelled the utmoſt efforts of the beſiegers. This ſo exaſperated Amrou, that he ſwore, "If God enabled him to conquer the Greeks, he would throw down the walls of the city, and make it as eaſy of acceſs as a *bawdy-houſe*, which lies open to every body." Nor did he fail to execute this menace; for having taken the town by ſtorm, he quite diſmantled it, entirely demoliſhing the walls and fortifications. The lives of the citizens, however, were ſpared, at leaſt as far as lay in the general's power; but many of them were put to the ſword by the ſoldiers on their firſt entrance. In one quarter particularly, Amrou found them butchering the Alexandrians with unrelenting barbarity; to which, however, by his ſeaſonable interpoſition, he put a ſtop, and on that ſpot erected a moſque, which he called the *moſque of mercy*.

From this time Alexandria never recovered its former ſplendor. It continued under the dominion of the khalifs till the year 924, when it was taken by the Magrebians, two years after its great church had been deſtroyed by fire. This church was called by the Arabs *Al Kaiſaria*, or *Cæſarea*; and had formerly been a pagan temple, erected in honour of Saturn by the famous queen Cleopatra.

The city was ſoon after abandoned by the Magrebians; but in 928 they again made themſelves maſters of it: their fleet being afterwards defeated by that belonging to the khalif, *Abul Kaſem* the Magrebian general retired from Alexandria, leaving there only a garriſon of 300 men; of which *Thmaïl*, the khalif's admiral, being appriſed, he in a few days appeared before the town, and carried off the remainder of the inhabitants to an iſland in the Nile called *Abukair*. This was done, to prevent Abul Kâſem from meeting with any entertainment at Alexandria, in caſe he ſhould think proper to return. According to Eutychius, above

300,000

Alexandria. 200,000 of the miserable inhabitants perished this year.

What contributed to raise Alexandria to such a prodigious height of splendor as it enjoyed for a long time, was its being the centre of commerce between the eastern and western parts of the world. It was with the view of becoming master of this lucrative trade, that Alexander built this city, after having extirpated the Tyrians, who formerly engrossed all the East-India traffic. Of the immense riches which that trade afforded, we may form an idea, from considering that the Romans accounted it a point of policy to oppress the Egyptians, especially the Alexandrians; and after the defeat of Zenobia, there was a single merchant of Alexandria who undertook to raise and pay an army out of the profits of his trade. The Greek emperors drew prodigious tributes from Egypt, and yet the khalifs found their subjects in so good circumstances as to screw up their revenues to three hundred millions of crowns.

Though the revolutions which happened in the government of Egypt, after it fell into the hands of the Mahometans, frequently affected this city to a very great degree; yet still the excellence of its port, and the innumerable conveniences resulting from the East-India trade, to whomsoever were masters of Egypt, preserved Alexandria from total destruction, even when in the hands of the most barbarous nations. Thus, in the 13th century, when the barbarism introduced by the Goths, &c. began to wear off from the European nations, and they acquired a taste for the elegancies of life, the old mart of Alexandria began to revive; and the port, though far from recovering its former magnificence, grew once more famous by becoming the centre of commerce: but having fallen under the dominion of the Turks, and the passage round the Cape of Good Hope being discovered by the Portuguese in 1499, a fatal blow was given to the Alexandrian commerce, and the city has since fallen into decay.

At present, the city of Alexandria is reckoned to have about 14,000 or 15,000 inhabitants; a strange colluvies of different nations, as well as from various parts of the Turkish empire. They are in general given to thieving and cheating; and (like their predecessors) seditious above all others, were they not kept in awe by the severity of their government. The British and French carry on a considerable commerce with them, and have each a consul residing here. Some Venetian ships also sail thither yearly, but with French colours, and under the protection of France. The subjects of those kingdoms which keep no consul here, are subjected to a tax by the Grand Signior: but the Jews have found out a method of indemnifying themselves for this disadvantage; namely, by selling their commodities cheaper than other foreigners can afford. They are also favoured by the farmers of the revenue; who know, that if they do not pay some private regard to them, the Jews have it in their power to cause fewer merchandizes come into their port during the two years that their farm lasts.

The present city is a kind of peninsula situated between the two ports. That to the westward was called by the ancients the *Portus Eunostus*, now the *Old Port*, and is by far the best; Turkish vessels only are allowed to anchor there: the other, called the *New Port*, is for the Christians; at the extremity of one of the arms of which stood the famous Pharos. The New Port, the only harbour for the Europeans, is clogged up with sand, insomuch that in stormy weather ships are liable to bilge; and the bottom being also rocky, the cables soon chafe and part; so that one vessel driving against a second, and that against a third, they are perhaps all lost. Of this there was a fatal instance 16 or 18 years ago, when 42 vessels were dashed to pieces on the mole in a gale of wind from the north-west, and numbers have been since lost there at different times. If it be asked in Europe, Why do they not repair the New Port? the answer is, That in Turkey they destroy every thing, and repair nothing. The old harbour will be destroyed likewise, as the ballast of vessels has been continually thrown into it for the last 200 years. The spirit of the Turkish government is to ruin the labours of past ages, and destroy the hopes of future times, because the barbarity of ignorant despotism never considers to-morrow.

In time of war, Alexandria is of no importance; no fortification is to be seen; even the Farillon, with its lofty towers, cannot be defended. It has not four cannon fit for service, nor a gunner who knows how to point them. The 500 janisaries, who should form the garrison, reduced to half that number, know nothing but how to smoke a pipe. But Alexandria is a place of which the conquest would be of no value. A foreign power could not maintain itself there, as the country is without water. This must be brought from the Nile by the kalidj, or canal of 12 leagues, which conveys it thither every year at the time of the inundation. It fills the vaults or reservoirs dug under the ancient city, and this provision must serve till the next year. It is evident, therefore, that were a foreign power to take possession, the canal would be shut, and all supplies of water cut off. It is this canal alone which connects Alexandria with Egypt; for from its situation without the Delta, and the nature of the soil, it really belongs to the deserts of Africa. Its environs are sandy, flat, and sterile, without trees and without houses; where we meet with nothing but the plant which yields the kali, and a row of palm trees which follows the course of the kalidj or canal.

The city is governed like others in the same kingdom. (See Egypt.) It hath a small garrison of soldiers, part of which are Janisaries and Assaffs; who are very haughty and insolent, not only to strangers, but to the mercantile and industrious part of the people, tho' ever so considerable and useful. The government is so remiss in favour of these wretches, that Mr Norden informs us, one of them did not hesitate to kill a farmer of the customs, for refusing to take less of him than the duty imposed, and went off unpunished; it being a common salvo among them, that what is done cannot be undone.

The present condition of Alexandria is very despicable, being now so far ruined, that the rubbish in many places overtops the houses. The famous tower of Pharos has long since been demolished, and a castle, called *Farillon*, built in its place. The causeway which joined the island to the continent is broken down, and its place supplied by a stone-bridge of several arches.

Some parts of the old walls of the city are yet standing, and present us with a masterpiece of ancient masonry. They are flanked with large towers, about 200 paces distant from each other, with small ones in the middle.

Alexandria. middle. Below are magnificent casemates, which may serve for galleries to walk in. In the lower part of the towers is a large square hall, whose roof is supported by thick columns of Thebaic stone. Above this are several rooms, over which there are platforms more than 20 paces square. The ancient reservoirs, vaulted with so much art, which extend under the whole town, are almost entire at the end of 2000 years.

Of Cæsar's palace there remain only a few porphyry pillars, and the front, which is almost entire, and looks very beautiful. The palace of Cleopatra was built upon the walls facing the port, having a gallery on the outside, supported by several fine columns. Not far from this palace are two obelisks vulgarly called *Cleopatra's Needles*. They are of Thebaic stone, and covered with hieroglyphics. One is overturned, broken, and lying under the sand; the other is on its pedestal. These two obelisks, each of them of a single stone, are about 60 feet high, by seven foot square at the base. Towards the gate of Rosetta, are five columns of marble on the place formerly occupied by the porticoes of the Gymnasium. The rest of the colonnade, the design of which was discoverable 100 years ago by Maillet, has since been destroyed by the barbarism of the Turks.

But what most engages the attention of travellers is the Pillar of Pompey, as it is commonly called, situated at a quarter of a league from the southern gate. It is composed of red granite. The capital is Corinthian, with palm leaves, and not indented. It is nine feet high. The shaft and the upper member of the base are of one piece of 90 feet long, and 9 in diameter. The base is a square of about 15 feet on each side. This block of marble, 60 feet in circumference, rests on two layers of stone bound together with lead; which, however, has not prevented the Arabs from forcing out several of them, to search for an imaginary treasure. The whole column is 114 feet high. It is perfectly well polished, and only a little shivered on the eastern side. Nothing can equal the majesty of this monument; seen from a distance, it overtops the town, and serves as a signal for vessels. Approaching it nearer, it produces an astonishment mixed with awe. One can never be tired with admiring the beauty of the capital, the length of the shaft, nor the extraordinary simplicity of the pedestal. This last has been somewhat damaged by the instruments of travellers, who are curious to possess a relick of this antiquity; and one of the volutes of the column was immaturely brought down about twelve years ago, by a prank of some English captains, which is thus related by Mr Irwin.

These jolly sons of Neptune had been pushing about the can on board one of the ships in the harbour, until a strange freak entered into one of their brains. The eccentricity of the thought occasioned it immediately to be adopted; and its apparent impossibility was but a spur for the putting it into execution. The boat was ordered; and with proper implements for the attempt, these enterprising heroes pushed ashore, to drink a bowel of punch on the top of Pompey's pillar! At the spot they arrived; and many contrivances were proposed to accomplish the desired point. But their labour was vain; and they began to despair of success, when the genius who struck out the frolic happily suggested the means of performing it. A man was dispatched to the city for a paper kite. The inhabitants were by this time apprized of what was going forward, and flocked in crowds to be witnesses of the address and boldness of the English. The governor of Alexandria was told that these seamen were about to pull down Pompey's pillar. But whether he gave them credit for their respect to the Roman warrior, or to the Turkish government, he left them to themselves; and politely answered, that the English were too great patriots to injure the remains of Pompey. He knew little, however, of the disposition of the people who were engaged in this undertaking. Had the Turkish empire rose in opposition, it would not perhaps at that moment have deterred them. The kite was brought, and flown so directly over the pillar, that when it fell on the other side, the string lodged upon the capital. The chief obstacle was now overcome. A two-inch rope was tied to one end of the string, and drawn over the pillar by the end to which the kite was affixed. By this rope one of the seamen ascended to the top; and in less than an hour, a kind of shroud was constructed, by which the whole company went up, and drank their punch amid the shouts of the astonished multitude. To the eye below, the capital of the pillar does not appear capable of holding more than one man upon it; but our seamen found it could contain no less than eight persons very conveniently. It is astonishing that no accident befel these madcaps, in a situation so elevated, that would have turned a landman giddy in his sober senses. The only detriment which the pillar received, was the loss of the volute beforementioned; which came down with a thundering sound, and was carried to England by one of the captains, as a present to a lady who commissioned him for a piece of the pillar. The discovery which they made amply compensated for this mischief; as without their evidence, the world would not have known at this hour, that there was originally a statue on this pillar, one foot and ancle of which are still remaining. The statue must have been of a gigantic size, to have appeared of a man's proportion at so great an height.

Voyage and Route, p. 370.

There are circumstances in this story which might give it an air of fiction, were it not demonstrated beyond all doubt. Besides the testimonies of many eyewitnesses, the adventurers themselves have left us a token of the fact, by the initials of their names, which are very legible in black paint just beneath the capital.

Learned men and travellers have made many fruitless attempts to discover in honour of what prince it was erected. The best informed have concluded, that it could not be in honour of Pompey, since neither Strabo nor Diodorus Siculus have spoken of it. The Arabian Abulfeda, in his description of Egypt, calls it *the Pillar of Severus*. And history informs us†, that this emperor "visited the city of Alexandria: That he granted a senate to its inhabitants, who until that time, under the subjection of a single Roman magistrate, had lived without any national council, as under the reign of the Ptolemies, when the will of the prince was their only law: That he did not confine his benefactions there; he changed several laws in their favour." This column, therefore, Mr Savary concludes to have been erected by the inhabitants as a mark of their gratitude to Severus. And in a Greek inscription,

† *Vide Spartian's Life of Severus*, chap. 17.

Alexandria.

tion, now half effaced, but viſible on the weſt ſide when the ſun ſhines upon it, and which probably was legible in the time of Abulfeda, he ſuppoſes the name of Severus to have been preſerved. He further obſerves, that this was not the only monument erected to him by the gratitude of the Alexandrians: for there is ſtill ſeen in the midſt of the ruins of Antinoe, built by Adrian, a magnificent pillar, the inſcription on which is ſtill remaining, dedicated to Alexander Severus.

On the ſouth-weſt ſide of the city, at a mile's diſtance, are ſituated the catacombs, the ancient burial-place of Alexandria; and although they cannot be compared to thoſe of the ancient Memphis, which the Arabs will not permit to be viſited, in order to make the better market of their mummies, it is probable that, the method of embalming being the ſame, the form of theſe catacombs can only differ in their proportions.—The Baron de Tott, in deſcribing theſe, obſerves, "that Nature not having furniſhed this part of Egypt with a ridge of rocks, like that which runs parrallel with the Nile above Delta, the ancient inhabitants of Alexandria could only have an imitation by digging into a bed of ſolid rock; and thus they formed Necropolis, or 'City of the Dead.' The excavation is from 30 to 40 feet wide, and 200 long and 25 deep, and is terminated by gentle declivities at each end. The two ſides, cut perpendicularly, contain ſeveral openings, about 10 or 12 feet in width and height, hollowed horizontally; and which form, by their different branches, ſubterranean ſtreets. One of theſe, which curioſity has diſencumbered from the ruins and ſands that render the entrance of others difficult or impoſſible, contains no mummies, but only the places they occupied. The order in which they were ranged is ſtill to be ſeen. Niches, 20 inches ſquare, ſunk ſix feet horizontally, narrowed at the bottom, and ſeparated from each other by partitions in the rock, ſeven or eight inches thick, divide into checkers the two walls of this ſubterranean vault. It is natural to ſuppoſe, from this diſpoſition, that each mummy was introduced with the feet foremoſt into the cell intended for its reception; and that new ſtreets were opened, in proportion as theſe dead inhabitants of Necropolis increaſed." This obſervation, he adds, which throws a light on the catacombs of Memphis, may perhaps likewiſe explain the vaſt ſize and multitude, as well as the different elevations, of the pyramids in the Higher and Lower Egypt.

About 70 paces from Pompey's pillar is the khalis, or the canal of the Nile, which was dug by the ancient Egyptians, to convey the water of the Nile to Alexandria, and fill the ciſterns under the city. On the ſide of the khalis are gardens full of orange and lemon trees, and the fields are full of caper and palm trees. On the top of a hill is a tower, on which a centinel is always placed, to give notice, by means of a flag, of the ſhips that are coming into the port. From this hill may be ſeen the ſea, the whole extent of the city, and the parts round it.

In going along the ſea-coaſt, there is a large baſon cut out of the rock that lines the ſhore. On the ſides of this baſon, two beautiful ſaloons are hewn out by the chiſel, with benches that run acroſs them. A canal made zig-zag, for the purpoſe of ſtopping the ſand by its different windings, conveys into them the water of the ſea, as pure and tranſparent as cryſtal. Seated on the ſtone bench, the water riſes a little above the waiſt; while the feet ſoftly repoſe on a fine ſand. The waves of the ſea are heard roaring againſt the rock, and foaming in the canal. The ſwell enters, raiſes you up, and leaves you; and thus alternately entering and retiring, brings a continual freſh ſupply of water, and a coolneſs which is truly delicious under a burning ſky. This place is vulgarly called the *Bath of Cleopatra*. Some ruins announce that it was formerly ornamented.

Alexandria, Alexandrian.

Alexandria is about 50 leagues north of Cairo. E. Long. 31. 15. N. Lat. 31. 12.

Alexandria, a ſtrong and conſiderable city of Italy, belonging to the Duchy of Milan, with a good caſtle, built in 1178 in honour of Pope Alexander III. This pope made it a biſhopric, with ſeveral privileges and exemptions. Prince Eugene of Savoy took this city in 1706, after three days ſiege. The French took it in 1745; but the king of Sardinia, to whom it belongs by the treaty of Utrecht, retook it in 1746. The fortifications of the town are trifling, but the citadel is conſiderable. It is 15 miles ſouth-eaſt of Caſſal, 35 north-by-weſt of Genoa, and 40 ſouth-by-weſt of Milan. E. Long. 8. 40. N. Lat. 44. 53. The country about this town is called the *Alexandrin*.

Alexandria (anc. geog.), a city of Arachoſia, called alſo *Alexandropolis*, on the river Arachotus (Stephanus, Iſidorus Characenus).—Another *Alexandria* in Gedroſia, built by Leonatus, by order of Alexander (Pliny).—A third *Alexandria* in Aria, ſituated at the lake Arias (Ptolemy); but, according to Pliny, built by Alexander on the river Arius.—A fourth in the Bactriana (Pliny).—A fifth *Alexandria*, an inland town of Carmania (Pliny, Ptolemy, Ammian).—A ſixth *Alexandria*, or *Alexandropolis*, in the Sogdiana (Iſidorus Characenus).—A ſeventh in India, at the confluence of the Aceſines and Indus (Arrian).—An eighth, called alſo *Alexandretta*, near the Sinus Iſſicus, on the confines of Syria and Cilicia, now *Scanderoon* (see Alexandretta), the port-town to Aleppo.—A ninth *Alexandria* of Margiana, which being demoliſhed by the barbarians, was rebuilt by Antiochus the ſon of Seleucus, and called *Antiochia* of Syria (Pliny); watered by the river Margus, which is divided into ſeveral channels, for the purpoſes of watering the country, which was called *Zotale*. The city was ſeventy ſtadia in circuit, according to Pliny; who adds, that, after the defeat of Craſſus, the captives were conveyed to this place by Orodes, the king of the Parthians.—A tenth, of the Oxiana, built on the Oxus by Alexander, on the confines of Bactria (Pliny).—An eleventh, built by Alexander at the foot of mount Paropamiſus, which was called *Caucaſus* (Pliny, Arrian).—A twelfth *Alexandria* in Troas, called alſo *Troas* and *Antigonia* (Pliny).—A thirteenth on the Iaxartes, the boundary of Alexander's victories towards Scythia, and the laſt that he built on that ſide.

ALEXANDRIAN, in a particular ſenſe, is applied to all thoſe who profeſſed or taught the ſciences in the ſchool of Alexandria. In this ſenſe, Clemens is denominated *Alexandrinus*, though born at Athens. The ſame may be ſaid of Apion, who was born at Oaſis; and Aroſtarchus, by birth a Samothracian. The chief Alexandrian philoſophers were, Amonius, Plotinus,

tinus, Origen, Porphyry, Jamblicus, Sopater, Maximus, and Dexippus.

ALEXANDRIAN is more particularly underſtood of a college of prieſts, conſecrated to the ſervice of Alexander Severus after his deification. Lampridius relates, that, notwithſtanding Severus was killed by Maximin, the ſenate proſecuted his apotheoſis; and, for regularity of worſhip, founded an order of prieſts, or *ſodales*, under the denomination of *Alexandrini*.

ALEXANDRIAN Library. See p. 389, *ſupra*.

ALEXANDRIAN Manuſcript, a famous copy of the Scriptures, conſiſting of four volumes, in a large quarto ſize; which contains the whole Bible in Greek, including the Old and New Teſtament, with the Apocrypha, and ſome ſmaller pieces, but not quite complete. This manuſcript is now preſerved in the Britiſh Muſeum. It was ſent as a preſent to King Charles I. from Cyrillus Lucaris, patriarch of Conſtantinople, by Sir Thomas Rowe, ambaſſador from England to the Grand Signior, about the year 1628. Cyrillus brought it with him from Alexandria, where probably it was written. In a ſchedule annexed to it, he gives this account: That it was written, as tradition informed them, by Thecla, a noble Egyptian lady, about 1300 years ago, not long after the council of Nice. But this high antiquity, and the authority of the tradition to which the patriarch refers, have been diſputed; nor are the moſt accurate biblical writers agreed about its age. Grabe thinks that it might have been written before the end of the fourth century; others are of opinion, that it was not writ till near the end of the fifth century, or ſomewhat later.

ALEXANDRIAN, or *Alexandrine*, in poetry, a kind of verſe conſiſting of twelve, or of twelve and thirteen ſyllables alternately; ſo called from a poem on the life of Alexander, written in this kind of verſe by ſome French poet. Alexandrines are peculiar to modern poetry, and ſeem well adapted to epic poems. They are ſometimes uſed by moſt nations of Europe; but chiefly by the French, whoſe tragedies are generally compoſed of Alexandrines.

ALEXICACUS, ſomething that preſerves the body from harm or miſchief. The word amounts to much the ſame as *alexiterial*.

ALEXICACUS, in antiquity, was an attribute of Neptune, whom the tunny-fiſhers uſed to invoke under this appellation, that their nets might be preſerved from the ξιφιας, or ſword-fiſh, which uſed to tear them; and that he might prevent the aſſiſtance which it was pretended the dolphins uſed to give the tunnies on this occaſion.

ALEXIPHARMICS, in medicine, are properly remedies for expelling or preventing the ill effects of poiſon: but ſome of the moderns having imagined, that the animal ſpirits, in acute diſtempers, were affected by a malignant poiſon, the term has been underſtood to mean medicines adapted to expel this poiſon by the cutaneous pores, in the form of ſweat. In this ſenſe, alexipharmics are the ſame as ſudorifics.

ALEXIS, a Piedmonteſe. There is a book of "Secrets," which for a long time has gone under his name. It was printed at Baſil 1536, in 8vo, and tranſlated from Italian into Latin by Wecher; it has alſo been tranſlated into French, and printed ſeveral times with additions. There is a preface to the piece, wherein Alexis informs us, that he was born of a noble family; that he had from his moſt early years applied himſelf to ſtudy; that he had learned the Greek, the Latin, the Hebrew, the Chaldean, the Arabian, and ſeveral other languages; that having an extreme curioſity to be acquainted with the ſecrets of nature, he had collected as much as he could during his travels for 57 years; that he piqued himſelf upon not communicating his ſecrets to any perſon; but that when he was 82 years of age, having ſeen a poor man who had died of a ſickneſs which might have been cured had he communicated his ſecret to the ſurgeon who took care of him, he was touched with ſuch a remorſe of conſcience, that he lived almoſt like a hermit: and it was in this ſolitude that he ranged his ſecrets in ſuch an order as to make them fit to be publiſhed. The hawkers generally carry them, with other books, to the country fairs. Theſe, however, contain only the ſelect remedies of Seignor Alexis of Piedmont; the entire collection would make too large a volume for them.

ALEXITERIAL, among phyſicians, a term of much the ſame import with *alexipharmic;* though ſometimes uſed in a ſynonymous ſenſe with amulet.

ALEYN (Charles), an Engliſh poet in the reign of Charles I. In 1631, he publiſhed two poems on the famous victories of Creſſy and Poictiers. He ſucceeded his father as clerk of the ordnance, and was commiſſary-general of the artillery to the king at the battle of Edge-hill. The next piece he wrote was a poem in honour of Henry VII. and the victory that gained him the crown of England. In 1639, the year before he died, he tranſlated the hiſtory of Eurialius and Lucretia, from the Latin epiſtles of Æneas Sylvius.

ALFANDIGA, the name of the cuſtomhouſe at Liſbon.

ALFAQUES, among the Moors, the name generally uſed for their clergy, or thoſe who teach the Mahometan religion; in oppoſition to the Morabites, who anſwer to monks among Chriſtians.

ALFATERNA (anc. geog.), the laſt town of Campania, beyond Veſuvius (Diodorus); the ſame with *Nocera*, which ſee. The inhabitants *Alfaterni* (Pliny).

ALFDOUCH, a name given by the Moors to a ſort of vermicelli, which they make of flour and water, and are very fond of in their entertainments.

ALFET, in our old cuſtoms, denotes a caldron full of boiling water, wherein an acuſed perſon, by way of trial or purgation, plunged his arm up to the elbow.

ALFORD, a town in Lincolnſhire, with a market on Tueſdays for proviſions and corn; and two fairs, on Whit-Tueſday, and November 8. for cattle and ſheep. It is ſeated on a ſmall brook that runs through the town, and is a compact place. A ſalt ſpring was diſcovered here in 1670, from the pigeons which flew thither in great numbers to drink the water; thoſe birds being known to be fond of ſalt. It contains a purging ſalt, together with a portion of ſea-ſalt. It is ſtrongly purgative. It is recommended as cooling, cleanſing, and attenuating. As a good remedy in the ſcurvy, jaundice, and other glandular obſtructions. It alſo promotes urine and ſweat, and therefore is good in gravelly and other diſorders of the kidneys and bladder; and in complaints ariſing from obſtructed perſpiration. Alford is ſix miles from the ſea, and 20 N. of Boſton. E. Long. 0. 15. N. Lat. 53. 30.

Alfred.

ALFRED, or ÆLFRED, the Great, king of England, was the fifth and youngeft fon of Æthelwolf king of the Weft Saxons, and was born at Wantage in Berkfhire in 849. He diftinguifhed himfelf, during the reign of his brother Ethelred, in feveral engagements againft the Danes; and upon his death fucceeded to the crown, in the year 871, and the 22d of his age. At his afcending the throne he found himfelf involved in a dangerous war with the Danes, and placed in fuch circumftances of diftrefs as called for the greateft valour, refolution, and all the other virtues with which he was adorned. The Danes had already penetrated into the heart of his kingdom; and before he had been a month upon the throne, he was obliged to take the field againft thofe formidable enemies. After many battles gained on both fides, he was at length reduced to the greateft diftrefs, and was entirely abandoned by his fubjects. In this fituation, Alfred, conceiving himfelf no longer a king, laid afide all marks of royalty, and took fhelter in the houfe of one who kept his cattle. He retired afterwards to the ifle of Æthelingey in Somerfetfhire, where he built a fort for the fecurity of himfelf, his family, and the few faithful fervants who repaired thither to him. When he had been about a year in this retreat, having been informed that fome of his fubjects had routed a great army of the Danes, killed their chiefs, and taken their magical ftandard (A), he iffued his letters, giving notice where he was, and inviting his nobility to come and confult with him. Before they came to a final determination, Alfred, putting on the habit of a harper, went into the enemy's camp, where, without fufpicion, he was every where admitted, and had the honour to play before their princes. Having thereby acquired an exact knowledge of their fituation, he returned in great fecrecy to his nobility, whom he ordered to their refpective homes, there to draw together each man as great a force as he could; and upon a day appointed there was to be a general randezvous at the great wood, called *Selwood*, in Wiltfhire. This affair was tranfacted fo fecretly and expeditioufly, that, in a little time, the king, at the head of an army, approached the Danes, before they had the leaft intelligence of his defign. Alfred, taking advantage of the furprife and terror they were in, fell upon them, and totally defeated them at Æthendune, now Eddington. Thofe who efcaped fled to a neighbouring caftle, where they were foon befieged, and obliged to furrender at difcretion. Alfred granted them better terms than they could expect. He agreed to give up the whole kingdom of the Eaft-Angles to fuch as would embrace the Chriftian religion, on condition they fhould oblige the reft of their countrymen to quit the ifland, and, as much as it was in their power, prevent the landing of any more foreigners. For the performance thereof he took hoftages; and when, in purfuance of the treaty, Guthrum the Danifh captain came, with thirty of his chief officers, to be baptized, Alfred anfwered for him at the font, and gave him the name of *Æthelftane;* and certain laws were drawn up betwixt the king and Guthrum for the regulation and government of the Danes fettled in England. In 884, a frefh number of Danes landed in Kent, and laid fiege to Rochefter; but the king coming to the relief of that city, they were obliged to abandon their defign. Alfred had now great fuccefs; which was chiefly owing to his fleet, an advantage of his own creating. Having fecured the fea-coafts, he fortified the reft of the kingdom with caftles and walled towns; and he befieged and recovered from the Danes the city of London, which he refolved to repair, and keep as a frontier (B).

After fome years refpite, Alfred was again called into the field: for a body of Danes, being worfted in the weft of France, came with a fleet of 250 fail on the coaft of Kent; and having landed, fixed themfelves at Apple-tree: fhortly after, another fleet of 80 veffels coming up the Thames, the men landed, and built a fort at Middleton. Before Alfred marched againft the enemy, he obliged the Danes, fettled in Northumberland and Effex, to give him hoftages for their good behaviour. He then moved towards the invaders, and pitched his camp between their armies, to prevent their junction. A great body, however, moved off to Effex; and croffing the river, came to Farnham in Surry, where they were defeated by the king's forces. Mean while the Danes fettled in Northumberland, in breach of treaty, and notwithftanding the hoftages given, equipped two fleets; and, after plundering the northern and fouthern coafts, failed to Exeter, and befieged it. The king, as foon as he received intelligence, marched againft them; but before he reached Exeter, they had got poffeffion of it. He kept them, however, blocked up on all fides; and reduced them at laft to fuch extremities, that they were obliged to eat their horfes, and were even ready to devour each other. Being at length rendered defperate, they made a general fally on the befiegers;

(A) "This (fays Sir John Spelman) was a banner with the image of a raven magically wrought by the three fifters of Hinguar and Hubba, on purpofe for their expedition, in revenge of their father Lodebroch's murder, made, they fay, almoft in an inftant, being by them at once begun and finifhed in a noontide, and believed by the Danes to have carried great fatality with it, for which it was highly efteemed by them. It is pretended, that being carried in battle, towards good fuccefs it would always feem to clap its wings, and make as if it would fly; but towards the approach of mifhap, it would hang down and not move." *Life of Alfred*, p. 61.

(B) The Danes had poffeffed themfelves of London in the time of his father; and had held it till now as a convenient place for them to land at, and fortify themfelves in; neither was it taken from them but by a clofe fiege. However, when it came into the king's hands, it was in a miferable condition, fcarce habitable, and all its fortifications ruined. The king, moved by the importance of the place, and the defire of ftrengthening his frontier againft the Danes, reftored it to its ancient fplendor. And obferving, that, through the confufion of the times, many, both Saxons and Danes, lived in a loofe diforderly manner, without owning any government, he offered them now a comfortable eftablifhment, if they would fubmit and become his fubjects. This propofition was better received than he expected; for multitudes growing weary of a vagabond kind of life, joyfully accepted fuch an offer. *Chron. Sax.* p. 88.

fiegers; but were defeated, though with great lofs on the king's fide. The remainder of this body of Danes fled into Effex, to the fort they had built there, and to their fhips. Before Alfred had time to recruit himfelf, another Danifh leader, whofe name was Laf, came with a great army out of Northumberland, and deftroyed all before him, marching on to the city of Werheal in the weft, which is fuppofed to be Chefter, where they remained the reft of that year. The year following they invaded North-Wales; and after having plundered and deftroyed every thing, they divided, one body returning to Northumberland, another into the territories of the Eaft-Angles; from whence they proceeded to Effex, and took poffeffion of a fmall ifland called *Merefig*. Here they did not long remain: for having parted, fome failed up the river Thames, and others up the Lea-road; where drawing up their fhips, they built a fort not far from London, which proved a great check upon the citizens, who went in a body and attacked it, but were repulfed with great lofs: at harveft-time the king himfelf was obliged to encamp with a body of troops in the neighbourhood of the city, in order to cover the reapers from the excurfions of the Danes. As he was one day riding by the fide of the river Lea, after fome obfervation, he began to think that the Danifh fhips might be laid quite dry: this he attempted, and fucceeded; fo that the Danes deferted their fort and fhips, and marched away to the banks of the Severn, where they built a fort, and wintered at a place called *Quatbrig* (c). Such of the Danifh fhips as could be got off, the Londoners carried into their own road; the reft they burnt and deftroyed.

Alfred enjoyed a profound peace during the three laft years of his reign, which he chiefly employed in eftablifhing and regulating his government, for the fecurity of himfelf and his fucceffors, as well as the eafe and benefit of his fubjects in general. After a troublefome reign of 28 years, he died on the 28th of October A. D. 900; and was buried at Winchefter, in Hydeabbey, under a monument of porphyry.

All our hiftorians agree in diftinguifhing him as one of the moft valiant, wifeft, and beft of kings that ever reigned in England; and it is alfo generally allowed, that he not only digefted feveral particular laws ftill in being, but that he laid the firft foundation of our prefent happy conftitution. There is great reafon to believe that we are indebted to this prince for trials by juries; and the doomfday book, which is preferved in the exchequer, is thought to be no more than another edition of Alfred's book of Winchefter, which contained a furvey of the kingdom. It is faid alfo, that he was the firft who divided the kingdom into fhires: what is afcribed to him is not a bare divifion of the country, but the fettling a new form of judicature; for after having divided his dominions into fhires, he fubdivided each fhire into three parts, called *trythings*. There are fome remains of this ancient divifion in the ridings of Yorkfhire, the laths of Kent, and the three parts of Lincolnfhire. Each trything was divided into hundreds or wapentakes; and thefe again into tythings or dwellings of ten houfeholders: each of thefe houfeholders ftood engaged to the king, as a pledge for the good behaviour of his family, and all the ten were mutually pledges for each other; fo that if any one of the tything was fufpected of an offence, if the head boroughs or chiefs of the tything would not be fecurity for him, he was imprifoned; and if he made his efcape, the tything and hundred were fined to the king. Each fhire was under the government of an earl, under whom was the reive, his deputy; fince, from his office, called *fhire-reive*, or *fherif*. And fo effectual were thefe regulations, that it is faid he caufed bracelets of gold to be hung up in the highways, as a challenge to robbers, and they remained untouched.

In private life, Alfred was the moft amiable man in his dominions; of fo equal a temper, that he never fuffered either fadnefs or unbecoming gaiety to enter his mind; but appeared always of a calm, yet cheerful difpofition, familiar to his friends, juft even to his enemies, kind and tender to all. He was a remarkable œconomift of his time, and Afferius has given us an account of the method he took for dividing and keeping an account of it: he caufed fix wax-candles to be made, each of 12 inches long, and of as many ounces weight; on the candles the inches were regularly marked, and having found that one of them burnt juft four hours, he committed them to the care of the keepers of his chapel, who from time to time gave him notice how the hours went: but as in windy weather the candles were wafted by the impreffion of the air on the flame, to remedy this inconvenience, he invented lanthorns, there being then no glafs in his dominions.

This prince, we are told, was 12 years of age before a mafter could be procured in the weftern kingdom to teach him the alphabet; fuch was the ftate of learning when Alfred began to reign. He had felt the mifery of ignorance; and determined even to rival his cotemporary Charlemagne in the encouragement of literature. He is fuppofed to have appointed perfons to read lectures at Oxford, and is thence confidered as the founder of that univerfity. By other proper eftablifhments, and by a general encouragement to men of abilities, he did every thing in his power to diffufe knowledge throughout his dominions. Nor was this end promoted more by his countenance and encouragement than by his own example and his writings. For notwithftanding the latenefs of his initiation, he had acquired extraordinary erudition; and, had he not been illuftrious as a king, he would have been famous as an author. His works are, 1. *Breviarum quoddam collectum ex Legibus Trojanorum*, &c. lib. I. A Breviary collected out of the Laws of the Trojans, Greeks, Britons, Saxons, and Danes, in one Book. Leland faw this book in the Saxon tongue, at Chrift-church in Hampfhire. 2. *Vifi-Saxonum Leges*, lib. I. The laws of the Weft-Saxons, in one book. Pitts tells us, that it is in Bennet-

(c) The king's contrivance is thought to have produced the meadow between Hertford and Bow; for at Hertford was the Danifh fort, and from thence they made frequent excurfions on the inhabitants of London. Authors are not agreed as to the method the king purfued in laying dry the Danifh fhips: Dugdale fuppofes that he did it by ftraitening the channel; but Henry of Huntingdon alleges, that he cut feveral canals, which exhaufted its water.

net-College library, at Cambridge. 3. *Inſtituta quædam*, lib. I. Certain Inſtitutes, in one book. This is mentioned by Pitts, and ſeems to be the ſecond capitulation with Guthrum. 4. *Contra judices iniquos*, lib. I. An Invective againſt Unjuſt Judges, in one book. 5. *Acta Magiſtratuum ſuorum*, lib. I. Acts of his Magiſtrates, in one book. This is ſuppoſed to be the book of judgments mentioned by Horne; and was, in all probability, a kind of reports, intended for the uſe of ſucceeding ages. 6. *Regum fortunæ variæ*, lib. I. The various Fortunes of Kings, in one book. 7. *Dicta ſapientum*, lib. I. The Sayings of Wiſe Men, in one book. 8. *Parobolæ et ſales*, lib. I. Parables and pleaſant Sayings, in one book. 9. *Collectiones chronicorum*. Collections of Chronicles. 10. *Epiſtolæ ad Wulfſigium Epiſcopum*, lib. I. Epiſtles to Biſhop Wulfsig, in one book. 11. *Manuale meditationum*. A Manual of Meditations.—Beſides theſe original works, he tranſlated many authors from the Latin, &c. into the Saxon language, *viz*. 1. Bede's Hiſtory of England, 2. Paulinus Oroſinus's Hiſtory of the Pagans. 3. St Gregory's Paſtoral, &c. The firſt of theſe, with his prefaces to the others, together with his laws, were printed at Cambridge, 1644. His laws are likewiſe inſerted in Spelman's Councils. 4. *Boethius de Conſolatione*, lib. V. Boetius's Conſolations of Philoſophy, in five books. Dr Plot tells us, king Alfred tranſlated it at Woodſtock, as he found in a MS. in the Cotton Library. 5. *Æſopi fabulæ*, Æſop's Fables: which he is ſaid to have tranſlated from the Greek both into Latin and Saxon. 6. *Pſalterium Davidicum*, lib. I. David's Pſalter, in one book. This was the laſt work the King attempted, death ſurpriſing him before he had finiſhed it; it was however completed by another hand, and publiſhed at London in 1640, in quarto, by Sir John Spelman. Several others are mentioned by Malmſbury; and the old hiſtory of Ely aſſerts, that he tranſlated the Old and New Teſtaments.

The life of this great king was firſt written by Aſſerius Menevenſis; and firſt publiſhed by Archbiſhop Parker, in the old Saxon character, at the end of his edition of Haſſingham's hiſtory, printed in 1674, fol.

ALGA, in botany, the trivial name of the lichen, fucus, and ſeveral other plants of the cryptogamia claſs.

ALGÆ, FLAGS; one of the ſeven families or natural tribes into which the whole vegetable kingdom is divided by Linnæus, in his *Philoſophia Botanica*. They are defined to be plants, whoſe root, leaf, and ſtem are all one. Under this deſcription are comprehended all the ſea-weeds, and ſome other aquatic plants. In the ſexual ſyſtem, they conſtitute the 3d order of the 24th claſs *Cryptogamia*; in Tournefort, the ſecond genus of the ſecond ſection, *Marinæ, aut fluviatiles*, of the 17th claſs, *Aſpermæ vulgo habitæ*; and the 57th order in Linnæus's Fragments of a Natural Method. The diſcoveries made in this part of the vegetable kingdom are uncertain, and imperfect; and the attempts, in particular, to arrange flags by the parts of the fructification, have not been attended with great ſucceſs. Dillenius has arranged this order of plants from their general habit and ſtructure; Michelius from the parts of fructification.—Each has conſiderable merit.

ALGAGIOLA, a ſmall ſea-port town in the iſland of Corſica, fortified with walls and baſtions. It was almoſt deſtroyed by the malcontents in 1731, but has ſince been repaired. E. Long. 9. 45. N. Lat. 42. 20.

ALGAROT, in chemiſtry, an Arabic term for an emetic powder, prepared from regulus of antimony, diſſolved in acids, and ſeparated by repeated lotions in warm water.

ALGAROTTI (Count), a celebrated Italian, was born at Padua; but the year is not mentioned. Led by curioſity, as well as a deſire of improvement, he travelled early into foreign countries; and was very young when he arrived in France in 1736. Here he compoſed his "Newtonian Philoſophy for the Ladies;" as Fontenelle had done his Carteſian Aſtronomy, in the work intitled, "The Plurality of worlds." He was noticed by the king of Pruſſia, who gave him marks of the eſteem he had for him. He died at Piſa the 23d of May, 1764; and ordered his own mauſoleum, with this inſcription to be fixed upon it: "Hic jacet Algarottus, ſed non omnis." He is allowed to have been a very great connoiſſeur in painting, ſculpture, and architecture. He contributed much to the reformation of the Italian opera. His works, which are numerous, and upon a variety of ſubjects, abound with vivacity, elegance, and wit: a collection of them has lately been made, and printed at Leghorn.

ALGARVA, a province in the kingdom of Portugal, 67 miles in length and 20 in breadth; bounded on the W. and S. by the ſea, on the E. by the river Guadiana, and on the N. by Alentejo. It is very fertile in figs, almonds, dates, olives, and excellent wines; beſides, the fiſhery brings in large ſums. The capital town is Pharo. It contains four cities, 12 towns, 67 pariſhes, and 61,000 inhabitants.

A L G E B R A,

Definition and etymology.

A GENERAL method of computation, wherein ſigns and ſymbols, commonly the letters of the alphabet, are made uſe of to repreſent numbers, or any other quantities.

This ſcience, properly ſpeaking, is no other than a kind of ſhort-hand, or ready way of writing down a chain of mathematical reaſoning on any ſubject whatever; ſo that it is applicable to arithmetic, geometry, aſtronomy, menſuration of all kinds of ſolids, &c. and the great advantages derived from it appear manifeſtly to ariſe from the conciſeneſs and perſpicuity with which every propoſition on mathematical ſubjects can be written down in algebraic characters, greatly ſuperior to the tedious circumlocutions which would be neceſſary were the reaſoning to be written in words at length.

With regard to the etymology of the word *algebra*, it is much conteſted by the critics. Menage derives it from the Arabic *algiabarat*, which ſignifies the reſtitution of any thing broken; ſuppoſing that the principal part of algebra is the conſideration of broken numbers. Others rather borrow it from the Spaniſh, *algebriſta*, a perſon who replaces diſlocated bones; adding,

History. ding, that algebra has nothing to do with fraction. Some, with M. d'Herbelot, are of opinion, that algebra takes its name from Gebar, a celebrated philosopher, chemist, and mathematician, whom the Arabs call Giaber, and who is supposed to have been the inventor. Others from *gefr*, a kind of parchment made of the skin of a camel, whereon Ali and Giafer Sadek wrote, in mystic characters, the fate of Mahometanism, and the grand events that were to happen till the end of the world. But others, with more probability, derive it from *geber;* a word whence, by prefixing the article *al*, we have formed *algebra;* which is pure Arabic, and properly signifies the reduction of fractions to a whole number. However, the Arabs, it is to be observed, never use the word *algebra* alone, to express what we mean by it; but always add to it the word *macabelah*, which signifies opposition and comparison: thus *algebra-almacabelah*, is what we properly call *algebra*.

Some authors define algebra, The art of solving mathematical problems; but this is rather the idea of analysis, or the analytic art. The Arabs call it, *The art of restitution and comparison;* or, *The art of resolution and equation.* Lucas de Burgo, the first European who wrote of algebra, calls it, *Regula rei et census;* that is, the rule of the root and its square; the root with them being called *res*, and the square *census*. Others call it *Specious Arithmetic;* and some, *Universal Arithmetic.*

History. It is highly probable that the Indians or Arabians first invented this noble art: for it may be reasonably supposed, that the ancient Greeks were ignorant of it; because Pappus, in his mathematical collections, where he enumerates their analysis, makes no mention of any thing like it; and, besides, speaks of a local problem, begun by Euclid, and continued by Apollonius, which none of them could fully resolve; which doubtless they might easily have done, had they known any thing of algebra.

Diaphantus was the first Greek writer of algebra; who published 13 books about the year 800, though only six of them were translated into Latin, by Xylander, in 1575; and afterwards, *viz. anno* 1621, in Greek and Latin, by M. Bachet and Fermat, with additions of their own. This algebra of Diaphantus's only extends to the solution of arithmetical indeterminate problems.

Before this translation of Diaphantus came out, Lucas Pacciolus, or Lucas de Burgo, a Minorite friar, published at Venice, in the year 1494, an Italian treatise of algebra. This author makes mention of Leonardus Pisanus, and some others, of whom he had learned the art; but we have none of their writings. He adds, that algebra came originally from the Arabs, and never mentions Diaphantus; which makes it probable, that that author was not then known in Europe. His algebra goes no farther than simple and quadratic equations.

After Pacciolus appeared Stifelius, a good author; but neither did he advance any farther.

After him came Scipio Ferreus, Cardan, Tartagilla, and some others, who reached as far as the solution of some cubic equations. Bombelli followed these, and went a little farther. At last came Nunnius, Ramus, Schoner, Salignac, Clavius, &c. who all of them took different courses, but none of them went beyond quadratics.

In 1590, Vieta introduced what he called his *Specious Arithmetic*, which consists in denoting the quantities, both known and unknown, by symbols or letters. He also introduced an ingenious method of extracting the roots of equations, by approximations; since greatly improved and facilitated by Raphson, Halley, Maclaurin, Simpson, and others.

Vieta was followed by Oughtred, who, in his *Clavis Mathematica*, printed in 1631, improved Vieta's method, and invented several compendious characters, to show the sums, differences, rectangles, squares, cubes, &c.

Harriot, another Englishman, cotemporary with Oughtred, left several treatises at his death; and among the rest, an Analysis, or Algebra, which was printed in 1631, where Vieta's method is brought into a still more commodious form, and is much esteemed to this day.

In 1657, Des Cartes published his geometry, wherein he made use of the literal calculus and the algebraic rules of Harriot; and as Oughtred in his Clavis, and Marin. Ghetaldus in his books of mathematical composition and resolution published in 1630, applied Vieta's arithmetic to elementary geometry, and gave the construction of simple and quadratic equations; so Des Cartes applied Harriot's method to the higher geometry, explaining the nature of curves by equations, and adding the constructions of cubic, biquadratic, and other higher equations.

Des Cartes's rule for constructing cubic and biquadratic equations, was farther improved by Thomas Baker, in his *Clavis Geometrica Catholica*, published in 1684; and the foundation of such constructions, with the application of algebra to the quadratures of curves, questions *de maximis et minimis*, the centrobaryc method of Guldinus, &c. was given by R. Slusius, in 1668; as also by Fermat in his *Opera Mathematica*, Roberval in the *Mem. de Mathem. et de Physique*, and Barrow in his *Lect. Geomet.* In 1708, algebra was applied to the laws of chance and gaming, by R. de Montmort; and since by de Moivre and James Bernouilli.

The elements of the art were compiled and published by Kersey, in 1671; wherein the specious arithmetic, and the nature of equations, are largely explained, and illustrated by a variety of examples: the whole substance of Diaphantus is here delivered, and many things added concerning mathematical composition and resolution from Ghetaldus. The like has been since done by Prestet in 1694, and by Ozanam in 1703: but these authors omit the application of algebra to geometry; which defect is supplied by Guisnec in a French treatise expressly on the subject published in 1704, and l'Hopital in his analytical treatise of the conic sections in 1707. The rules of algebra are also compendiously delivered by Sir Isaac Newton, in his *Arithmetica Universalis*, first published in 1707, which abounds in select examples, and contains several rules and methods invented by the author.

Algebra has also been applied to the consideration and calculus of infinites; from whence a new and extensive branch of knowledge has arisen, called the *Doctrine of Fluxions*, or *Analysis of Infinites*, or the *Calculus Differentialis*.

In-

P A R T I.

Introduction.

Introduction.

A Quantity which can be meafured, and is the object of mathematics, is of two kinds, *Number* and *Extenfion*. The former is treated of in *Arithmetic*; the latter in *Geometry*.

Numbers are ranged in a fcale, by the continued repetition of fome one number, which is called the *Root*; and, in confequence of this order, they are conveniently expreffed in words, and denoted by characters. The operations of arithmetic are eafily derived from the eftablifhed method of notation, and the moft fimple reafonings concerning the relations of magnitude.

Inveftigations by the common arithmetic are greatly limited, from the want of characters to exprefs the quantities that are unknown, and their different relations to one another, and to fuch as are known. Hence letters and other convenient fymbols have been introduced to fupply this defect; and thus gradually has arifen the fcience of *Algebra*, properly called *Univerfal Arithmetic*.

In the common arithmetic too, the given numbers difappear in the courfe of the operation, fo that general rules can feldom be derived from it; but, in algebra, the known quantities, as well as the unknown, may be expreffed by letters, which, through the whole operation, retain their original form; and hence may be deduced, not only general canons for like cafes, but the dependence of the feveral quantities concerned, and likewife the determination of a problem, without exhibiting which, it is not completely refolved. This general manner of expreffing quantities alfo, and the general reafonings concerning their connections, which may be founded on it, have rendered this fcience not lefs ufeful in the demonftration of theorems than in the refolution of problems.

If geometrical quantities be fuppofed to be divided into equal parts, their relations, in refpect of magnitude, or their proportions, may be expreffed by numbers; one of thefe equal parts being denoted by the unit. Arithmetic, however, is ufed in expreffing only the conclufions of geometrical propofitions; and it is by algebra that the bounds and application of geometry have been of late fo far extended.

The proper objects of mathematical fcience are number and extenfion; but mathematical inquiries may be inftituted alfo concerning any phyfical quantities that are capable of being meafured or expreffed by numbers and extended magnitudes: And, as the application of algebra may be equally univerfal, it has been called *The fcience of quantity in general.*

Definitions.

Definitions.

1. Quantities which are known are generally reprefented by the firft letters of the alphabet, as a, b, c, &c. and fuch as are unknown by the laft letters, as x, y, z, &c.
2. The fign $+$ (*plus*) denotes, that the quantity before which it is placed is to be added. Thus $a+b$ denotes the fum of a and b; $3+5$ denotes the fum of 3 and 5, or 8. When no fign is expreffed, $+$ is underftood.
3. The fign $-$ (*minus*) denotes, that the quantity before which it is placed is to be fubtracted. Thus $a-b$ denotes the excefs of a above b; $6-2$ is the excefs of 6 above 2, or 4. *Note*, Thefe characters $+$ and $-$, from their extenfive ufe in algebra, are called *the figns*; and the one is faid to be *oppofite* or *contrary* to the other.
4. Quantities which have the fign $+$ prefixed to them are called *pofitive* or *affirmative*; and fuch as have the fign $-$ prefixed to them are called *negative*.
5. Quantities which have the fame fign, either $+$ or $-$, are alfo faid to have *like figns*, and thofe which have different figns are faid to have *unlike figns*. Thus $+a, +b$, have like figns, and $+a, -c$, are faid to have unlike figns.
6. The *juxtapofition* of letters as in the fame word, expreffes the product of the quantities denoted by thefe letters. Thus ab expreffes the product of a and b; bcd expreffes the continued product of b, c, and d. The fign $\times$ alfo expreffes the product of any two quantities between which it is placed.
7. A number prefixed to a letter is called a *numeral coefficient*, and expreffes the product of the quantity by that number, or how often the quantity denoted by the letter is to be taken. When no number is prefixed, unit is underftood.
8. The *quotient* of two quantities is denoted by placing the *dividend* above a fmall line and the *divifor* below it. Thus $\frac{18}{3}$ is the quotient of 18 divided by 3, or 6; $\frac{a}{b}$ is the quotient of a divided by b. This expreffion of a quotient is alfo called a *fraction*.
9. A quantity is faid to be *fimple*, which confifts of one part or *Term*, as $+a$, $-abc$; and a quantity is faid to be *compound*, when it confifts of more than one term, connected by the figns $+$ or $-$. Thus $a+b$, $a-b+c$, are compound quantities. If there are two terms, it is called a *binomial*; if three, a *trinomial*, &c.
10. Simple quantities, or the terms of compound quantities, are faid to be *like*, which confift of the fame letter or letters, equally repeated. Thus $+ab$, $-5ab$, are like quantities; but $+ab$, and $+aab$, are unlike.
11. The equality of two quantities is expreffed, by placing the fign $=$ between them. Thus $x+a=b-c$, means that the fum of x and a is equal to the excefs of b above c.

When quantities are confidered abftractly, then $+$ and $-$ denote addition and fubtraction only, according to Def. 2. and 3. and the terms *pofitive* and *negative* exprefs the fame ideas. In that cafe, a negative quantity by itfelf is unintelligible. The fign $+$ alfo is unneceffary before fimple quantities, or before the leading term of a compound quantity which is not negative; though, when fuch a quantity or term is to be added to another, $+$ muft be placed before it, to exprefs that addition; and hence in Def. 2. it is faid, that $+$ is underftood when no fign is expreffed.

In geometry, however, and in certain applications of

of geometry and algebra, there may be an opposition or contrariety in the quantities, analogous to that of addition and subtraction; and the signs + and — may very conveniently be used to express that contrariety. In such cases, negative quantities are understood to exist by themselves; and the same rules take place in operations into which they enter, as are used with regard to the negative terms of abstract quantities.

CHAP. I.

Sect. I. *Fundamental Operations.*

The fundamental operations in algebra are the same as in common arithmetic, *Addition, Subtraction, Multiplication*, and *Division;* and from the various combinations of these four, all the others are derived.

Prob. I. *To add Quantities.*

Simple quantities, or the terms of compound quantities, to be added together, may be *like with like signs, like with unlike signs*, or they may be *unlike.*

Case 1. To add terms that are like and have like signs.

Rule. Add together the coefficients, to their sum prefix the common sign, and subjoin the common letter or letters.

Examp.		
To	$5ab$	$3aa-ab$
Add	$4ab$	$7aa-2ab$
		$4aa-5ab$
Sum	$9ab$	$14aa-8ab.$

Case 2. To add terms that are like, but have unlike signs.

Rule. Subtract the less coefficient from the greater; prefix the sign of the greater to the remainder, and subjoin the common letter or letters.

Examp.		
$-4a$	$+7bc$	$-5ab$
$+7a$	$-3bc$	$+2ab$
	$+bc$	$+3ab$
$+3a$	$+5bc$	0

Case 3. To add terms that are unlike.

Rule. Set them all down, one after another, with their signs and coefficients prefixed.

Examp. $2a+3b$
$-5c+8$

$2a+3b-5c+8$

Compound quantities are added together, by uniting the several terms of which they consist by the preceding rules.

Examp. The sum of $\begin{cases} 5ab-3xy-12cd \\ 7xy-ab+15 \\ 9cd-xy-mn \end{cases}$

is $4ab-3cd+15-mn+3xy$

The rule for case 3. may be considered as the general rule for adding all algebraical quantities whatsoever; and, by the rules in the two preceding cases, the like terms in the quantities to be added may be united, so as to render the expression of the sum more simple.

Prob. II. *To subtract Quantities.*

General Rule. Change the signs of the quantity to be subtracted into the contrary signs, and then add it, so changed, to the quantity from which it was to be subtracted (by Prob. I.); the sum arising by this addition is the remainder.

Examp.		
From	$+5a$	$7ab-16bc$
Subtract	$+3a$	$3ab+mb$
Rem.	$+2a$	$4ab-16bc-mb$

From	$5a-7b+9c+8$
Subt.	$2a-4b+9c-d$
Rem.	$3a-3b * +8+d$

When a positive quantity is to be subtracted, the rule is obvious from Def. 3.: In order to show it, when the negative part of a quantity is to be subtracted, let $c-d$ be subtracted from a, the remainder, according to the rule, is $a-c+d$. For if c is subtracted from a, the remainder is $a-c$ (by Def. 3.); but this is too small, because c is subtracted instead of $c-d$, which is less than it by d; the remainder therefore is too small by d; and d being added, it is $a-c+d$, according to the rule.

Otherwise If the quantity d be added to these two quantities a and $c-d$, the difference will continue the same; that is, the excess of a above $c-d$ is equal to the excess of $a+d$ above $c-d+d$; that is, to the excess of $a+d$ above c, which plainly is $a+d-c$; and is therefore the remainder required.

Prob. III. *To multiply Quantities.*

General Rule for the Signs. When the signs of the two terms to be multiplied are like, the sign of the product is +; but, when the signs are unlike, the sign of the product is —.

Case 1. To multiply two terms.

Rule. Find the sign of the product by the general rule; after it place the product of the numeral coefficients, and then set down all the letters one after another, as in one word.

Mult.	$+a$	$+5b$	$-5ax$
By	$+b$	$-3c$	$-7ab$
	$+ab$	$-15bc$	$+35aabx$

The reason of this rule is derived from Def. 6. and from the nature of multiplication, which is a repeated addition of one of the quantities to be multiplied as often as there are units in the other. Hence also the letters in two terms multiplied together may be placed in any order, and therefore the order of the alphabet is generally preferred.

Case 2. To multiply compound quantities.

Rule. Multiply every term of the multiplicand by all the terms of the multiplier, one after another, according to the preceding rule, and then collect all the products into one sum; that sum is the product required.

Examp.

$$\begin{array}{lr}
\text{Mult.} & 2a+3b \\
\text{By} & 3ax-4by \\
\hline
 & 6aax+9abx \\
 & -8aby-12bby \\
\hline
\text{Prod.} & 6aax+9abx-8aby-12bby
\end{array}
\qquad
\begin{array}{r}
m+x \\
m-x \\
\hline
mm+mx \\
-mx-xx \\
\hline
mm^{*}-xx
\end{array}$$

$$\begin{array}{lr}
\text{Mult.} & a-b \\
\text{By} & c-d \\
\hline
 & ac-cb \\
 & -ad+db \\
\hline
\text{Prod.} & ac-cb-ad+db
\end{array}$$

Of the general Rule for the Signs.

The reason of that rule will appear by proving it, as applied to the last mentioned example of $a-b$ multiplied by $c-d$, in which every case of it occurs.

Since multiplication is a repeated addition of the multiplicand as often as there are units in the multiplier, hence, if $a-b$ is to be multiplied by c, $a-b$ must be added to itself as often as there are units in c, and the product therefore must be $ca-cb$ (Prob. I.).

But this product is too great; for $a-b$ is to be multiplied, not by c, but by $c-d$ only, which is the excess of c above d; d times $a-b$ therefore, or $da-db$, has been taken too much; hence this quantity must be subtracted from the former part of the product, and the remainder, which (by Prob. II.) is $ca-cb-da+db$, will be the true product required.

Def. 12. When several quantities are multiplied together, any of them is called a *factor* of the product.

13. The products arising from the continual multiplication of the same quantity are called the *powers* of that quantity, which is the root. Thus, aa, aaa, $aaaa$, &c. are powers of the root a.

14. These powers are expressed, by placing above the root, to the right hand, a figure, denoting how often the root is repeated. This figure is called an *index*, or *exponent*, and from it the power is denominated. Thus,

a	is called the	1st	Power of the root a, and is otherwise expressed by	a^1 or a
aa		2d		a^2
aaa		3d		a^3
$aaaa$		4th		a^4, &c.

The 2d and 3d powers are generally called the *square* and *cube*; and the 4th, 5th, and 6th, are also sometimes respectively called the *biquadrate*, *sursolid*, and *cubocube*.

Cor. Powers of the same root are multiplied by adding their exponents, Thus, $a^3 \times a^2 = a^5$, or $aaa \times aa = aaaaa$, $b^3 \times b = b^4$.

Scholium.

Sometimes it is convenient to express the multiplication of quantities, by setting them down with the sign ($\times$) between them, without performing the operation according to the preceding rules; thus $a^2 \times b$ is written instead of a^2b; and $\overline{a-b} \times \overline{c-d}$ expresses the product of $a-b$, multiplied by $c-d$.

Def. 15. A *vinculum* is a line drawn over any number of terms of a compound quantity, to denote those which are understood to be affected by the particular sign connected with it.

Thus, in the last example, it shows that the terms $+a$ and $-b$, and also c and $-d$ are all affected by the sign ($\times$). Without the vinculum, the expression $a-b \times c-d$ would mean the excess of a above bc and d; and $\overline{a-b \times c}-d$ would mean the excess of the product of $a-b$ by c, above d. Thus also, $\overline{a+b}\,)^2$ expresses the second power of $a+b$, or the product of that quantity multiplied by itself; whereas $a+b^2$ would express only the sum of a and b^2; and so of others. By some writers a parenthesis ( ) is used as a vinculum, and $(a+b)^2$ is the same thing as $\overline{a+b}\,)^2$.

Prob. IV. *To divide Quantities.*

General Rule for the Signs. If the signs of the divisor and dividend are like, the sign of the quotient is $+$; if they are unlike, the sign of the quotient is $-$.

This rule is easily deduced from that given in Prob. III.; for, from the nature of division, the quotient must be such a quantity as, multiplied by the divisor, shall produce the dividend with its proper sign.

From Def. 8. the quotient of any two quantities may be expressed, by placing the dividend above a line and the divisor below it. But a quotient may often be expressed in a more simple and convenient form, as will appear from the following distinction of the cases.

Case I. When the divisor is simple, and is a factor of all the terms of the dividend. This is easily discovered by inspection; for then the coefficient of the divisor measures that of all the terms of the dividend, and all the letters of the divisor are found in every term of the dividend.

Rule. The letter or letters in the divisor are to be expunged out of each term in the dividend, and the coefficients of each term to be divided by the coefficient of the divisor; the quantity resulting is the quotient.

Ex. $a)\,ab\,(b.$ $\quad 2aab)\,6a^3bc-4a^2bdm\,(3ac-2dm$

The reason of this is evident from the nature of division, and from Def. 6. *Note.* It is obvious from corollary to Prob. III. that powers of the same root are divided by subtracting their exponents.

Thus $a^2)a^3\,(a$ $\quad a^3)a^7\,(a^4$. Also $a^2b)\,a^3b^6\,(ab^5$.

Case II. When the divisor is simple, but not a factor of the dividend.

Rule. The quotient is expressed by a fraction, according to Def. 8. viz. by placing the dividend above a line and the divisor below it.

Thus the quotient of $3ab^2$ divided by $2mbc$ is the fraction $\dfrac{3ab^2}{2mbc}$.

Such expressions of quotients may often be reduced to a more simple form, as shall be explained in the second part of this chapter.

Case III. When the divisor is compound.

Rule 1. The terms of the dividend are to be ranged according to the powers of some one of its letters; and those of the divisor, according to the powers of the same letter.

Thus, if $a^2+2ab+b^2$ is the dividend, and $a+b$ the divisor, they are ranged according to the powers of a.

2. The first term of the dividend is to be divided by the first term of the divisor (observing the general rule for the signs); and this quotient being set down as a part of the quotient wanted, is to be multiplied by the whole divisor, and the product subtracted from the dividend. If nothing remain, the division is finished: the remainder, when there is any, is a new dividend.

Thus, in the preceding example, a^2 divided by a, gives a, which is the first part of the quotient wanted: and the product of this part by the whole divisor $a+b$, viz. a^2+ab being subtracted from the given dividend, there remains in this example $ab+b^2$.

3. Divide the first term of this new dividend by the first term of the divisor as before, and join the quotient to the part already found, with its proper sign: then multiply the whole divisor by this part of the quotient, and subtract the product from the new dividend; and thus the operation is to be continued till no remainder is left, or till it appear that there will always be a remainder.

Thus, in the preceding example, $+ab$, the first term of the new dividend divided by a, gives b; the product of which, multiplied by $a+b$, being subtracted from $ab+b^2$, nothing remains, and $a+b$ is the true quotient. The entire operation is as follows.

$$\begin{array}{l}
a+b)\ a^2+2ab+b^2\ (a+b \\
\qquad\ \ a^2+\ ab \\
\qquad\ \ \overline{\qquad\quad ab+b^2} \\
\qquad\qquad\quad ab+b^2 \\
\qquad\qquad\quad \overline{\qquad\quad}
\end{array}$$

$$\begin{array}{l}
\qquad\qquad\qquad\qquad\qquad\quad * \ * \\
3a-b)\ 3a^3-12a^2-a^2b+10ab-2b^2\ (a^2-4a+2b \\
\qquad\quad 3a^3 \qquad\quad -a^2b \\
\qquad\quad \overline{\qquad -12a^2 \qquad +10ab} \\
\qquad\qquad -12a^2 \qquad +\ 4ab \\
\qquad\quad \overline{\qquad\qquad\qquad +6ab-2b^2} \\
\qquad\qquad\qquad\qquad\ \ +6ab-2b^2 \\
\qquad\qquad\qquad\qquad\ \ \overline{\qquad\qquad}
\end{array}$$

$$\begin{array}{l}
\qquad\qquad\qquad\qquad\ \ * \quad\ * \\
1-a)\ 1\ (1+a+a^2+a^3,\ \&c. \\
\qquad 1-a \\
\qquad \overline{\qquad +a} \\
\qquad\qquad +a-a^2 \\
\qquad\qquad \overline{\qquad +a^2} \\
\qquad\qquad\qquad +a^2-a^3 \\
\qquad\qquad\qquad \overline{\qquad +a^3,\ \&c.}
\end{array}$$

It often happens, as in the last example, that there is still a remainder from which the operation may be continued without end. This expression of a quotient is called *an infinite series;* the nature of which shall be considered afterwards. By comparing a few of the first terms, the law of the series may be discovered, by which, without any more division, it may be continued to any number of terms wanted.

Of the General Rule.

The reason of the different parts of this rule is evident; for, in the course of the operation, all the terms of the quotient obtained by it are multiplied by all the terms of the divisor, and the products are successively subtracted from the dividend till nothing remain: that, therefore, from the nature of division, must be the true quotient.

Note. The sign $\div$ is sometimes used to express the quotient of two quantities between which it is placed: Thus, $\overline{a^2+x^2}\div\overline{a+x}$, expresses the quotient of a^2+x^2 divided by $a+x$.

§ 2. Of Fractions.

Definitions.

1. When a quotient is expressed by a fraction, the dividend above the line is called the *numerator;* and the divisor below it is called the *denominator.*
2. If the numerator is less than the denominator, it is called a *proper fraction.*
3. If the numerator is not less than the denominator, it is called an *improper fraction.*
4. If one part of a quantity is an integer, and the other a fraction, it is called a *mixt quantity.*
5. The *reciprocal* of a fraction, is a fraction whose numerator is the denominator of the other; and whose denominator is the numerator of the other. The reciprocal of an integer is the quotient of 1 divided by that integer. Thus,

   $\frac{b}{a}$ is the reciprocal of $\frac{a}{b}$; and $\frac{1}{m}$ is the reciprocal of m.

The distinctions in Def. 2, 3, 4, properly belong to common arithmetic, from which they are borrowed, and are scarcely used in algebra.

The operations concerning fractions are founded on the following proposition:

If the divisor and dividend be either both multiplied or both divided by the same quantity, the quotient is the same; or, if both the numerator and denominator of the fraction be either multiplied or divided by the same quantity, the value of that fraction is the same.

Thus, let $\frac{a}{b}=c$, then $\frac{ma}{mb}=c$. For, from the nature of division, if the quotient $\frac{a}{b}$ $(=c)$ be multiplied by the divisor b, the product must be the dividend a. Hence $\left(\frac{a}{b}\times b=\right)bc=a$, and likewise $ma=mbc$, and dividing both by mb, $\frac{ma}{mb}=c$. Conversely, if $\frac{ma}{mb}=c$, then also $\frac{a}{b}=c$.

 Cor.

Fundamental operations.

Cor. 1. Hence a fraction may be reduced to another of the same value, but of a more simple form, by dividing both numerator and denominator by any common measure.

$$\text{Thus, } \frac{30ax-54ay}{12ab}=\frac{5x-9y}{2b}.$$

$$\frac{8ab+6ac}{4a^2}=\frac{4b+3c}{2a}.$$

Cor. 2. A fraction is multiplied by any integer, by multiplying the numerator, or dividing the denominator by that integer: and conversely, a fraction is divided by any integer, by dividing the numerator, or multiplying the denominator by that integer.

PROB. I. *To find the greatest common Measure of two Quantities.*

1. Of pure numbers.

Rule. Divide the greater by the less: and, if there is no remainder, the less is the greatest common measure required. If there is a remainder, divide the last divisor by it; and thus proceed, continually dividing the last divisor by its remainder, till no remainder is left, and the last divisor is the greatest common measure required.

The greatest common measure of 45 and 63 is 9; the greatest common measure of 187 and 391 is 17. Thus,

$$\begin{array}{l} 45)63(1 \\ \quad 45 \\ \hline \quad 18)45(2 \\ \qquad 36 \\ \hline \qquad 9)18(2 \\ \qquad\quad 18 \\ \hline \qquad\quad 0 \end{array} \qquad\qquad \begin{array}{l} 187)391(2 \\ \quad 374 \\ \hline \quad 17)187(11 \\ \qquad 187 \\ \hline \qquad\ * \end{array}$$

From the nature of this operation, it is plain that it may always be continued till there be no remainder. The rule depends on the two following principles:

1. A quantity which measures both divisor and remainder must measure the dividend.

2. A quantity which measures both divisor and dividend must also measure the remainder.

For a quantity which measures two other quantities, must also measure both their sum and difference; and, from the nature of division, the dividend consists of the divisor repeated a certain number of times, together with the remainder. By the first it appears, that the number found by this rule is a common measure; and, by the second, it is plain there can be no greater common measure; for, if there were, it must necessarily measure the quantity already found less than itself, which is absurd.

When the greatest common measure of algebraical quantities is required, if either of them be simple, any common simple divisor is easily found by inspection. If they are both compound, any common simple divisor may also be found by inspection. But, when the greatest compound divisor is wanted, the preceding rule is to be applied; only,

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2. The simple divisors of each of the quantities are to be taken out, the remainders in the several operations are also to be divided by their simple divisors, and the quantities are always to be ranged according to the powers of the same letter.

The simple divisors in the given quantities, or in the remainders, do not affect a compound divisor which is wanted; and hence also, to make the division succeed, any of the dividends may be multiplied by a simple quantity. Besides the simple divisors in the remainders not being found in the divisors from which they arise, can make no part of the common measure sought; and for the same reason, if in such a remainder there be any compound divisor which does not measure the divisor from which it proceeds, it may be taken out.

EXAMPLES.

$$\begin{array}{l} a^2-b^2)\ a^2-2ab+b^2\ (1 \\ \qquad\quad\ \ a^2-b^2 \\ \hline \end{array}$$

$-2ab+2b^2$ Remainder, which divided by $-2b$ is $a-b)\ a^2-b^2\ (a+b$

$$\begin{array}{r} a^2-b^2 \\ \hline *\ \ * \end{array}$$

If the quantities given are $8a^2b^2-10ab^3+2b^4$, and $9a^4b-9a^3b^2+3a^2b^3-3ab^4$. The simple divisors being taken out, *viz.* $2b^2$ out of the first, it becomes $4a^2-5ab+b^2$, and $3ab$ out of the second, it is $3a^3-3a^2b+ab^2-b^3$. As the latter is to be divided by the former, it must be multiplied by 4, to make the operation succeed, and then it is as follows:

$$\begin{array}{l} 4a^2-5ab+b^2)\ 12a^3-12a^2b+4ab^2-4b^3\ (3a \\ \qquad\qquad\qquad\ \ 12a^3-15a^2b+3ab^2 \\ \hline \qquad\qquad\qquad\qquad\quad 3a^2b+ab^2-4b^3 \end{array}$$

This remainder is to be divided by b, and the new dividend multiplied by 3, to make the division proceed. Thus,

$$\begin{array}{l} 3a^2+ab-4b^2)\ 12a^2-15ab+3b^2\ (4 \\ \qquad\qquad\qquad\ \ 12a^2+4ab-16b^2 \\ \hline \qquad\qquad\qquad\qquad -19ab+19b^2 \end{array}$$

and this remainder, divided by $-19b$, gives $a-b$, which being made a divisor, divides $3a^2+ab-4b^2$ without a remainder, and therefore $a-b$ is the greatest compound divisor: but there is a simple divisor b, and therefore $\overline{a-b}\times b$ is the greatest common measure required.

PROB. II. *To reduce a Fraction to its lowest Terms.*

Rule. Divide both numerator and denominator by their greatest common measure, which may be found by prob. 1.

Thus, $\frac{75abc}{125bcx}=\frac{3a}{5x}$, $25bc$ being the greatest common measure, $\frac{a^4-b^4}{a^5-a^3b^2}=\frac{a^2+b^2}{a^3}$ also,

$$\frac{9a^4b-9a^3b^2+3a^2b^3-3ab^4}{8a^2b^2-10ab^3+2b^4}=\frac{9a^3+3ab^2}{8ab-2b^2}$$ the greatest common measure being $\overline{a-b}\times b$, by Prob. 1.

PROB.

Fundamental operations.

Prob. III. *To reduce an Integer to the Form of a Fraction.*

Rule. Multiply the given integer by any quantity for a numerator, and set that quantity under the product for a denominator.

Thus, $a=\frac{ma}{m}$, $a+b=\frac{a^2-b^2}{a-b}$.

Cor. Hence, in the following operations concerning fractions, an integer may be introduced; for, by this problem, it may be reduced to the form of a fraction. The denominator of an integer is generally made 1.

Prob. IV. *To reduce Fractions with different Denominators to Fractions of equal Value, that shall have the same Denominator.*

Rule. Multiply each numerator, separately taken into all the denominators but its own, and the products shall give the new numerators. Then multiply all the denominators into one another, and the product shall give the common denominator.

Example. Let the fractions be $\frac{a}{b}$, $\frac{c}{d}$, $\frac{e}{f}$; they are respectively equal to $\frac{adf}{bdf}$, $\frac{bcf}{bdf}$, $\frac{bde}{bdf}$.

The reason of the operation appears from the preceding proposition; for the numerator and denominator of each fraction are multiplied by the same quantities; and the value of the fractions therefore is the same.

Prob. V. *To add and subtract Fractions.*

Rule. Reduce them to a common denominator, then add or subtract the numerators; and the sum or difference set over the common denominator is the sum or remainder required.

Ex. Add together $\frac{a}{b}$, $\frac{c}{d}$, $\frac{e}{f}$ the sum is $\frac{adf+cbf+bde}{bdf}$,

From $\frac{a}{b}$ subt. $\frac{c}{d}$ the difference is $\frac{ad-bc}{bd}$.

From the nature of division it is evident, that, when several quantities are to be divided by the same divisor, the sum of the quotients is the same with the quotient of the sum of the quantities divided by that common divisor.

In like manner, the difference of two fractions having the same denominator, is equal to the difference of the numerators divided by that common denominator.

Cor. 1. By Cor. Prob. 3. integers may be reduced to the form of fractions, and hence integers and fractions may be added and subtracted by this rule. Hence also what is called a mixt quantity may be reduced into the form of a fraction by bringing the integral part into the form of a fraction, with the same denominator as the fractional part, and adding or subtracting the numerators according as the two parts are connected by the signs + or —.

Thus, $b+\frac{c}{d}=\frac{bd+c}{d}$; and $a-\frac{a^2-b^2}{2a}=\frac{2a^2-a^2+b^2}{2a}=\frac{a^2+b^2}{2a}$

Cor. 2. A fraction, whose numerator is a compound quantity, may be distinguished into parts, by dividing the numerator into several parts, and setting each over the original denominator, and uniting the new fractions (reduced if necessary) by the signs of their numerators.

Thus, $\frac{a^2-2ab+b^2}{2a}=\frac{a^2}{2a}-\frac{2ab}{2a}+\frac{b^2}{2a}=\frac{a}{2}-b+\frac{b^2}{2a}$.

Prob. VI. *To multiply Fractions.*

Rule. Multiply their numerators into one another, to obtain the numerator of the product; and the denominators, multiplied into one another, shall give the denominator of the product.

Ex. $\frac{a}{b}\times\frac{c}{d}=\frac{ac}{bd}$. $\frac{a+b}{c}\times\frac{a-b}{d}=\frac{a^2-b^2}{cd}$

For, if $\frac{a}{b}$ is to be multiplied by c, the product is $\frac{ca}{b}$; but if it is to be multiplied only by $\frac{c}{d}$ the former product must be divided by d, and it becomes $\frac{ca}{bd}$ (Cor. 2. to the preceding problem.)

Or, let $\frac{a}{b}=m$, and $\frac{c}{d}=n$. Then $a=bm$, and $c=dn$, and $ac=bdmn$, and $(mn=)\ \frac{a}{b}\times\frac{c}{d}=\frac{ac}{bd}$.

Prob. VII. *To divide Fractions.*

Rule. Multiply the numerator of the dividend by the denominator of the divisor; their product shall give the numerator of the quotient. Then multiply the denominator of the dividend by the numerator of the divisor, and their product shall give the denominator.

Or, Multiply the dividend by the reciprocal of the divisor; the product will be the quotient wanted.

Thus, $\frac{a}{b}\Big)\frac{c}{d}\Big(\frac{bc}{ad}=\frac{c}{d}\times\frac{b}{a}$.

For, if $\frac{c}{d}$ is to be divided by a, the quotient is $\frac{c}{da}$; but $\frac{c}{d}$ is to be divided, not by a, but by $\frac{a}{b}$; therefore the former quotient must be multiplied by b, and it is $\frac{bc}{da}$.

Or, let $\frac{a}{b}=m$, and $\frac{c}{d}=n$; then $a=bm$, and $c=dn$; also $ad=bdm$ and $bc=bdn$; therefore $\left(\frac{bdn}{bdm}=\right)\frac{n}{m}=\frac{bc}{ad}$.

Scholium.

By these problems, the four fundamental operations may be performed, when any terms of the original quantities, or of those which arise in the course of the operation, are fractional.

Ex-

Of Proportion.

Example. Mult. $\frac{a^2}{2x} - \frac{3ax}{2b}$

By $\frac{ab}{3x} - 4x$

Prod. $\frac{a^3b}{6x^2} - \frac{a^2}{2} - 2a^2 + \frac{6ax^2}{b}$

$$
\begin{array}{l}
a+x)\,a^2+x^2\,(a-x+\frac{2x^2}{a}-\frac{2x^3}{a^2}, \text{ \&c.}\\
\quad a^2+ax\\
\hline
\quad -ax+x^2\\
\quad -ax-x^2\\
\hline
\quad\quad 2x^2\\
\quad\quad 2x^2+\frac{2x^3}{a}\\
\hline
\quad\quad -\frac{2x^3}{a}\\
\quad\quad -\frac{2x^3}{a}-\frac{2x^4}{a^2}\\
\hline
\quad\quad\quad +\frac{2x^4}{a^2}, \text{ \&c.}
\end{array}
$$

This quotient becomes a ferious, of which the law of continuation is obvious, without any farther operation.

In fuch cafes, when we arrive at a remainder of one term, it is commonly fet down with the divifor below it, after the other terms of the quotient, which then becomes a mixt quantity. Thus the laft quotient is alfo expreffed by $a-x+\frac{2x^2}{a+x}$

CHAP. II.

Of Proportion.

By the preceding operations quantities of the fame kind may be compared together.

The relation arifing from this comparifon is called *ratio* or *proportion*, and is of two kinds. If we confider the difference of the two quantities, it is called *arithmetical proportion*; and if we confider their quotient, it is called *geometrical proportion*. This laft being moft generally ufeful, is commonly called fimply *proportion*.

1. Of Arithmetical Proportion.

Definition. When of four quantities the difference of the firft and fecond is equal to the difference of the third and fourth, the quantities are called *arithmetical proportionals*.

Cor. Three quantities may be arithmetically proportional, by fuppofing the two middle terms of the four to be equal.

Prop. In four quantities arithmetically proportional, the fum of the extremes is equal to the fum of the means.

Let the four be a, b, c, d. Therefore from Def. $a-b=c-d$; to thefe add $b+d$ and $a+d=b+c$.

Cor. 1. Of four arithmetical proportionals, any three being given, the fourth may be found.

Thus, let a, b, c, be the 1ft, 2d, and 4th terms, and let x be the 3d which is fought.

Then by def. $a+c=b+x$, and $x=a+c-b$.

Cor. 2. If three quantities be arithmetical proportionals, the fum of the extremes is double of the middle term; and hence, of three fuch proportionals, any two being given, the third may be found.

2. Of Geometrical Proportion.

Definition. If of four quantities, the quotient of the firft and fecond is equal to the quotient of the third and fourth, thefe quantities are faid to be in *geometrical proportion*. They are alfo called *proportionals*. Thus, if a, b, c, d, are the four quantities, then $\frac{a}{b}=\frac{c}{d}$. and their ratio is thus denoted $a : b :: c : d$.

Cor. Three quantities may be geometrical proportionals, viz. by fuppofing the two middle terms of the four to be equal. If the quantities are a, b, c, then $\frac{a}{b}=\frac{b}{c}$, and the proportion is expreffed thus, $a : b : c$.

Prop. I. The product of the extremes of four quantities geometrically proportional is equal to the product of the means; and converfely.

Let $a : b :: c : d$.

Then by Def. $\frac{a}{b}=\frac{c}{d}$

and multiplying both by bd, $ad=bc$.

If $ad=bc$, then dividing by bd, $\frac{a}{b}=\frac{c}{d}$, that is, $a : b :: c : d$.

Cor. 1. The product of the extremes of three quantities, geometrically proportional, is equal to the fquare of the middle term.

Cor. 2. Of four quantities geometrically proportional, any three being given, the fourth may be found.

Ex. Let a, b, c, be the three firft; to find the 4th. Let it be x, then $a : b :: c : x$, and by this propofition,

$$ax=bc$$

and dividing both by a, $x=\frac{bc}{a}$.

This coincides with the Rule of Three in arithmetic, and may be confidered as a demonftration of it. In applying the rule to any particular cafe, it is only to be obferved, that the quantities muft be fo connected and fo arranged, that they be proportional, according to the preceding definition.

Cor. 3. Of three geometrical proportionals, any two being given, the third may be found.

Prop. II. If four quantities be geometrically proportional, then if any equimultiples whatever be taken of the firft and third, and alfo any equimultiples whatever of the fecond and fourth; if the multiple of the firft be greater than that of the fecond, the multiple of the third will be greater than that of the fourth; and if equal, equal; and if lefs, lefs.

For, let a, b, c, d, be the four proportionals. Of the

Of Equations.

the first and third, ma and mc may represent any equimultiples whatever, and also nb, nd, may represent any equimultiples of the second and fourth. Since $a:b::c:d$, $ad=bc$; and hence multiplying by mn, $mnad=mnbc$, and therefore (Conv. Prop. 1.) $ma:nb::mc:nd$; and from the definition of proportionals, it is plain, that if ma is greater than nb, mc must be greater than nd; and if equal, equal; and if less, less.

Prop. III. If four quantities are proportionals, they will also be proportionals when taken alternately or inversely, or by composition, or by division, or by conversion. See Def. 13. 14. 15. 16. 17. of Book V. of Euclid, Simson's edition.

By Prop. II. they will also be proportionals accordino to Def. 5. Book V. of Euclid; and therefore this proposition is demonstrated by propositions 16, B, 18, 17, E, of the same book.

Otherwise algebraically.

Let $a:b::c:d$, and therefore $ad=bc$.

Altern.	$a:c::b:d$
Invert.	$b:a::d:c$
Divid.	$a-b:b::c-d:d$
Comp.	$a+b:b::c+d:d$
Convert.	$a:a-b::c:c-d$

For since $ad=bc$, it is obvious, that in each of these cases the product of the extremes is equal to the product of the means; the quantities are therefore proportionals. (Prop. 1.)

Prop. IV. If four numbers be proportionals, according to Def. 5. V. B. of Euclid, they will be geometrically proportional, according to the preceding definition.

1st, Let the four numbers be integers, and let them be a, b, c, d. Then if b times a and b times c be taken, and also a times b and a times d, since ba the multiple of the first is equal to ab the multiple of the second, bc, the multiple of the third, must be equal to ad the multiple of the fourth. And since $bc=ad$, by Prop. 1. a, b, c, and d, must be geometrical proportionals.

2dly, If any of the numbers be fractional, all the four being multiplied by the denominators of the fractions, they continue proportionals, according to Def. 5. B. V. Euclid (by Prop. 4. of that book); and the four integer quantities produced being such proportionals, they will be geometrical proportionals, by the first part of this prop.; and therefore, being reduced by division to their original form, they manifestly will remain proportionals, according to the algebraical definition.

CHAP. III.

Sect. I. *Of Equations in general, and of the Solution of simple Equations.*

Definitions.

1. An Equation may in general be defined to be a proposition asserting the equality of two quantities; and is expressed by placing the sign $=$ between them.

2. When a quantity stands alone upon one side of an equation, the quantities on the other side are said to be a *value* of it. Thus in the equation $x=b+y-d$, x stands alone on one side, and $b+y-d$ is a value of it.

3. When an unknown quantity is made to stand alone on one side of an equation, and there are only known quantities on the other, that equation is said to be *resolved;* and the value of the unknown quantity is called a *root* of the equation.

4. Equations containing only one unknown quantity and its powers, are divided into *orders*, according to the highest power of the unknown quantity to be found in any of its terms.

If the highest power of the unknown quantity in any term be the	1st,	The Equation is called	*Simple*,
	2d,		*Quadrat.*
	3d, &c.		*Cubic*, &c.

But the exponents of the unknown quantity are supposed to be integers, and the equation is supposed to be cleared of fractions, in which the unknown quantity, or any of its powers, enter the denominators.

Thus, $x+a=\frac{3x-b}{c}$ is a simple equation; $3x-\frac{5}{2x}=12$, when cleared of the fraction by multiplying both sides by $2x$, becomes $6x^2-5=24x$ a quadratic. $x^3-2x^4=x^6-20$ is an equation of the sixth order, &c.

As the general relations of quantity which may be treated of in algebra, are almost universally either that of equality, or such as may be reduced to that of equality, the doctrine of equations becomes one of the chief branches of the science.

The most common and useful application of algebra is in the investigation of quantities that are unknown, from certain given relations to each other, and to such as are known; and hence it has been called the *analytical art.* The equations employed for expressing these relations must therefore contain one or more unknown quantities; and the principal business of this art will be, the deducing equations containing only one unknown quanrity, and resolving them.

The solution of the different orders of equations will be successively explained. The preliminary rules in the following section are useful in all orders, and are alone sufficient for the solution of simple equations.

§ 1. *Of simple Equations, and their Resolution.*

Simple equations are resolved by the four fundamental operations already explained; and the application of them to this purpose is contained in the following rules.

Rule 1. Any quantity may be transposed from one side of an equation to the other, by changing its sign.

Thus, if $3x-10=2x+5$
Then, $3x-2x=10+5$ or $x=15$
Thus also, $5x+b=a+2x$
By transp. $3x=a-b$.

This rule is obvious from prob. 1. and 2.; for it is equivalent to adding equal quantities to both sides of the equation, or to subtracting equal quantities from both sides.

Cor.

Of Equations.

Cor. The signs of all the terms of an equation may be changed into the contrary signs, and it will continue to be true.

Rule. 2. Any quantity by which the unknown quantity is multiplied may be taken away, by dividing all the other quantities of the equation by it.

Thus, if $ax=b$

$$x=\frac{b}{a}$$

Also, if $mx+nb=am$

$$x+\frac{nb}{m}=a$$

For if equal quantities are divided by the same quantity, the quotients are equal.

Rule 3. If a term of an equation is fractional, its denominator may be taken away, by multiplying all the other terms by it.

Thus, if $\frac{x}{a}=b+c$ Also, if $a-\frac{b}{x}=c$

$x=ab+ac$ $ax-b=cx$

And by transf. $ax-cx=b$

And by div. $x=\frac{b}{a-c}$

For if all the terms of the equation are multiplied by the same quantity, it remains a true proposition.

Corollary to the three last Rules.

If any quantity be found on both sides of the equation, with the same sign, it may be taken away from both. (Rule 1.)

Also, if all the terms in the equation are multiplied or divided by the same quantity, it may be taken out of them all. (Rule 2. and 3.)

Ex. If $3x+a=a+b$, then $3x=b$.

If $2ax+3ab=ma+a^2$, then $2x+3b=m+a$.

If $\frac{x}{3}-\frac{4}{3}=\frac{16}{3}$, then $x-4=16$,

Any simple equation may be resolved by these rules in the following manner. *1st*, Any fractions may be taken away by R. 3. *2dly*, All the terms including the unknown quantity, may be brought to one side of the equation, and the known terms to the other, by R. 1. *Lastly*, If the unknown quantity is multiplied by any known quantity, it may be made to stand alone by R. 2. and the equation will then be resolved. Def. 3.

Examples of simple Equations resolved by these Rules.

I.

If $3x+5=x+9$

R. 1. $2x=4$

R. 2. $x=\frac{4}{2}=2$

II.

If $5x-\frac{5x}{2}+12=\frac{4x}{3}+26$

R. 1. $5x-\frac{5x}{2}-\frac{4x}{3}=14$

R. 3. $30x-15x-8x=84$

Or $7x=84$

R. 2. . . $x=\frac{84}{7}=12$

III.

If $\frac{5}{x}+\frac{9}{4}=16$

R. 3. $\frac{20}{x}+9=64$

R. 3. $20+9x=64x$

R. 1. $20=55x$

R. 2. $x=\frac{20}{55}=\frac{4}{11}$

§ 2. Solution of Questions producing simple Equations.

From the resolution of equations we obtain the resolution of a variety of useful problems, both in pure mathematics and physics, and also in the practical arts founded upon these sciences. In this place, we consider the application of it to those questions where the quantities are expressed by numbers, and their magnitude alone is to be considered.

When an equation, containing only one unknown quantity, is deduced from the question by the following rules, it is sometimes called a *final equation.* If it be simple, it may be resolved by the preceding rules; but if it be of a superior order, it must be resolved by the rules afterwards to be explained. The examples in this chapter are so contrived, that the final equation may be simple.

The rules given in this section for the solution of questions, though they contain a reference to simple equations only, are to be considered as general, and as applicable to questions which produce equations of any order.

General Rule. The unknown quantities in the question proposed must be expressed by letters, and the relations of the known and unknown quantities contained in it, or the conditions of it, as they are called, must be expressed by equations. These equations being resolved by the rules of this science, will give the answer of the question.

For example, if the question is concerning two numbers, they may be called x and y, and the conditions from which they are to be investigated must be expressible by equations.

Thus, if it be required that the sum of two numbers sought be 60, that condition is expressed thus $x+y=60$

If their difference must be 24, then $x-y=24$

If their product is 1640, then $xy=1640$

If their quotient must be 6, then $\frac{x}{y}=6$

If their ratio is as 3 to 2, then $x:y::3:2$, and therefore $2x=3y$

These are some of the relations which are most easily expressed. Many others occur which are less obvious; but as they cannot be described in particular rules, the algebraical expression of them is best explained by examples, and must be acquired by experience.

A

Of Equations.

A distinct conception of the nature of the question, and of the relations of the several quantities to which it refers, will generally lead to the proper method of stating it, which in effect may be considered only as a translation from common language into that of algebra.

Case I. When there is only one unknown quantity to be found.

Rule. An equation involving the unknown quantity must be deduced from the question (by the general rule). This equation being resolved by the rules of the last section, will give the answer.

It is obvious, that, when there is only one unknown quantity, there must be only one independent equation contained in the question; for any other would be unnecessary, and might be contradictory to the former.

Examp. 1. To find a number, to which if there be added a half, a third part, and a fourth part of itself, the sum will be 50.

Let it be z: then half of it is $\frac{z}{2}$, a third of it $\frac{z}{3}$, &c.

Therefore, $z+\frac{z}{2}+\frac{z}{3}+\frac{z}{4}=50$

$$24z+12z+8z+6z=1200$$
$$50z=1200$$
$$z=24.$$

If the operation be more complicated, it may be useful to register the several steps of it, as in the following

Examp. 2. A trader allows L. 100 *per annum* for the expences of his family, and augments yearly that part of his stock which is not so expended by a third of it; at the end of three years his original stock was doubled. What had he at first?

Let his first stock be	1	z
Of which he spends the first year L. 100, and there remains	2	$z-100$
This remainder is increased by a third of itself	3	$z-100+\frac{z-100}{3}=\frac{4z-400}{3}$
The second year he spends L. 100, and there remains	4	$\frac{4z-400}{3}-100=\frac{4z-700}{3}$
He increases the remainder by one-third of it	5	$\frac{4z-700}{3}+\frac{4z-700}{9}=\frac{16z-2800}{9}$
The third year he spends L. 100, and there remains	6	$\frac{16z-2800}{9}-100=\frac{16z-3700}{9}$
He increases it by one-third	7	$\frac{16z-3700}{9}+\frac{16z-3700}{27}=\frac{64z-14800}{27}$
But at the end of the third year his stock is doubled; therefore	8	$\frac{64z-14800}{27}=2z$
By R. 3.	9	$64z-14800=54z$
By R. 1.	10	$10z=14800$
By R. 2.	11	$z=1480$

Therefore his stock was L. 1480; which being tried, answers the conditions of the question.

Case II. When there are two unknown quantities.

Rule. Two independent equations involving the two unknown quantities, must be derived from the question. A value of one of the unknown quantities must be derived from each of the equations: and these two values being put equal to each other, a new equation will arise, involving only one unknown quantity, and may therefore be resolved by the preceding rule.

Two equations must be deduced from the question: for, from one including two unknown quantities, it is plain, a known value of either of them cannot be obtained, more than two equations would be unnecessary; and if any third condition were assumed at pleasure, most probably it would be inconsistent with the other two, and a question containing three such conditions would be absurd.

It is to be observed, however, that the two conditions, and hence the two equations expressing them, must be independent; that is, the one must not be deducible from the other by any algebraical reasoning: for, otherwise, there would in effect be only one equation, under two different forms, from which no solution can be derived.

Examp. 3. Two persons, A and B, were talking of their ages: says A to B, Seven years ago I was just three times as old as you were, and seven years hence I shall be just twice as old as you will be. I demand their present ages.

Let the ages of A and B be respectively	1	x and y
Seven years ago they were	2	$x-7$ and $y-7$
Seven years hence they will be	3	$x+7$ and $y+7$
Therefore by Quest. 1. and 2.	4	$x-7=3\times\overline{y-7}=3y-21$
Also by Quest. 2. and 3.	5	$x+7=2\times\overline{y+7}=2y+14$
By 4. and transp.	6	$x=3y-14$
By 5. and transp.	7	$x=2y+7$
By 6. and 7.	8	$3y-14=2y+7$
Transp. and 8.	9	$y=21$
By 9. and 6. or 7.	10	$x=49$

The ages of A and B then are 49 and 21, which answer the conditions.

The

Of Equations.

The operation might have been a little ſhortened by ſubtracting the 4th from 5th, and thus $14=-y+35$; and hence $y=21$. therefore (by 6th) $x=(3y-14)=49$.

Examp. 4. A gentleman diſtributing money among ſome poor people, found he wanted 10s. to be able to give 5s. to each; therefore he gives each 4s. only, and finds he has 5s. left.—To find the number of ſhillings and poor people.

If any queſtion ſuch as this, in which there are two quantities ſought, can be reſolved by means of one letter, the ſolution is in general more ſimple than when two are employed. There muſt be, however, two independent conditions; one of which is uſed in the notation of one of the unknown quantities, and the other gives an equation.

Let the number of poor be	1	z
The number of ſhillings will be	2	$5z-10$
The number of ſhillings is alſo	3	$4z+5$
By 2. and 3.	4	$5z-10=4z+5$.
Tranſp.	5	$z=15$.

The number of poor therefore is 15, and the number of ſhillings is $(4z+5=)$ 65, which anſwer the conditions.

Examp. 5. A courier ſets out from a certain place, and travels at the rate of 7 miles in 5 hours; and 8 hours after, another ſets out from the ſame place, and travels the ſame road, at the rate of 5 miles in 3 hours: I demand how long and how far the firſt muſt travel before he is overtaken by the ſecond?

Let the number of hours which the firſt travelled be	1	y
Then the ſecond travelled	2	$y-8$
The firſt travelled ſeven miles in 5 hours, and therefore in y hours	3	$(5:7::y:)\frac{7y}{5}$ miles
In like manner the ſecond travelled in $y-8$ hours	4	$(3:5::y-8:)\frac{5y-40}{3}$ miles
But they both travelled the ſame number of miles; therefore by 3. and 4.	5	$\frac{5y-40}{3}=\frac{7y}{5}$
Mult.	6	$25y-200=21y$
Tranſp.	7	$4y=200$
Divid.	8	$y=50$

The firſt then travelled 50 hours, the ſecond $(y-8=)$ 42 hours.

The miles travelled by each $\left(\frac{7y}{5}=\frac{5y-40}{3}=\right)$ 70.

Caſe III. When there are three or more unknown quantities.

Rule. When there are three unknown quantities, there muſt be three independent equations ariſing from the queſtion; and from each of theſe a value of one of the unknown quantities muſt be obtained. By comparing theſe three values, two equations will ariſe, involving only two unknown quantities, which may therefore be reſolved by the rule for Caſe 2.

In like manner may the rule be extended to ſuch queſtions as contain four or more unknown quantities; and hence it may be inferred, That, when juſt as many independent equations may be derived from a queſtion as there unknown quantities in it, theſe quantities may be found by the reſolution of equations.

Of Equations.

Examp. 6. To find three numbers, ſo that the firſt, with half the other two, the ſecond with one third of the other two, and the third with one fourth of the other two, may each be equal to 34.

Let the numbers be x, y, z, and the equations are

	1	$x+\frac{y+z}{2}=34$
	2	$y+\frac{x+z}{3}=34$
	3	$z+\frac{x+y}{4}=34$
From the 1ſt	4	$x=\frac{68-y-z}{2}$
From the 2d	5	$x=102-3y-z$
From the 3d	6	$x=136-4z-y$
From 4th and 5th	7	$\frac{68-y-z}{2}=102-3y-z$
7th reduced	8	$y=\frac{136-z}{5}$
5=6, and reduced	9	$y=\frac{3z-34}{2}$
8 and 9	10	$\frac{3z-34}{2}=\frac{136-z}{5}$
10th reduced	11	$15z-170=272-2z$
	12	$17z=442$ or $z=26$
By 8 and 5	13	$y=22$ and $x=10$

Examp. 7. To find a number conſiſting of three places, whoſe digits are in arithmetical proportion; if this number be divided by the ſum of its digits, the quotient will be 48; and if from the number be ſubtracted 198, the digits will be inverted.

Let the 3 digits be	1	x, y, z
Then the number is	2	$100x+10y+z$
If the digits be inverted, it is	3	$100z+10y+x$
The digits are in ar. prop. therefore	4	$x+z=2y$
By queſtion	5	$\frac{100x+10y+z}{x+y+z}=48$
By queſtion	6	$100x+10y+z-198=100z+10y+x$
From 6 and tranſ.	7	$99x=99z+198$
Divid. by 99	8	$x=z+2$
From 4	9	$x=2y-z$
8 and 9	10	$2y-z=z+2$
Tranſp.	11	$y=z+1$
Mult. 5.	12	$100x+10y+z=48x+48y+48z$
Tranſp.	13	$52x=38y+47z$
8 and 11 ſubſtit. for x and y	14	$52z+104=38z+38+47z$
Tranſp.	15	$33z=66$
Divid.	16	$\begin{cases} z=2 \\ y=(z+1=)\ 3 \\ x=(z+2=)\ 4. \end{cases}$

The number then is 432, which ſucceeds upon trial.

It

Of Equations

It ſometimes happens, that all the unknown quantities, when there are more than two, are not in all the equations expreſſing the conditions, and therefore the preceding rule cannot be literally followed. The ſolution, however, will be obtained by ſuch ſubſtitutions as are uſed in Ex. 7. and 9. or by ſimilar operations, which need not be particularly deſcribed.

Corollary to the preceding Rules.

It appears that, in every queſtion, there muſt be as many independent equations as unknown quantities; if there are not, then the queſtion is called *indeterminate*, becauſe it may admit of an infinite number of anſwers; ſince the equations wanting may be aſſumed at pleaſure. There may be other circumſtances, however, to limit the anſwers to one, or a preciſe number, and which, at the ſame time, cannot be directly expreſſed by equations. Such are theſe; that the numbers muſt be integers, ſquares, cubes, and many others. The ſolution of ſuch problems, which are alſo called *diophantine*, ſhall be conſidered afterwards.

Scholium.

On many occaſions, by particular contrivances, the operations by the preceding rules may be much abridged. This however, muſt be left to the ſkill and practice of the learner. A few examples are the following.

1. It is often eaſy to employ fewer letters than there are unknown quantities, by expreſſing ſome of them from a ſimple relation to others contained in the conditions of the queſtion. Thus, the ſolution becomes more eaſy and elegant. (See Ex. 4. 5.)

2. Sometimes it is convenient to expreſs by letters, not the unknown quantities themſelves, but ſome other quantities connected with them, as their ſum, difference, &c. from which they may be eaſily derived. (See Ex. 1. of chap. 5.)

In the operation alſo, circumſtances will ſuggeſt a more eaſy road than that pointed out by the general rules. Two of the original equations may be added together, or may be ſubtracted; ſometimes they muſt be previouſly multiplied by ſome quantity, to render ſuch addition or ſubtraction effectual, in exterminating one of the unknown quantities, or otherwiſe promoting the ſolution. Subſtitutions may be made of the values of quantities, in place of quantities themſelves, and various other ſuch contrivances may be uſed, which will render the ſolution much leſs complicated. (See Ex. 3. 7. and 9.)

SECT. II. *General Solution of Problems.*

IN the ſolutions of the queſtions in the preceding part, the given quantities (being numbers) diſappear in the laſt concluſion, ſo that no general rules for like caſes can be deduced from them. But if letters are uſed to denote the known quantities, as well as the unknown, a general ſolution may be obtained, becauſe, during the whole courſe of the operation, they retain their original form. Hence alſo the connection of the quantities will appear in ſuch a manner as to diſcover the neceſſary limitations of the data, when there are any, which is eſſential to the perfect ſolution of a problem. From this method, too, it is eaſy to derive a ſynthetical demonſtration of the ſolution.

When letters, or any other ſuch ſymbols, are employed to expreſs all the quantities, the algebra is ſometimes called *ſpecious* or *literal*.

Examp. 8. To find two numbers, of which the ſum and difference are given.

Let s be the given ſum, and d the given difference. Alſo, let x and y be the two numbers ſought.

$$x+y=s$$
$$x-y=d$$
$$\text{Whence }\begin{cases}x=s-y\\x=d+y\end{cases}$$
$$d+y=s-y$$
$$2y=s-d$$
$$y=\frac{s-d}{2}$$
$$\text{And } x=\frac{s+d}{2}$$

Thus, let the given ſum be 100, and the difference 24. Then $x=\left(\frac{s+d}{2}=\frac{124}{2}=\right)62$ & $y=\left(\frac{s-d}{2}=\frac{76}{2}=\right)38$.

In the ſame manner may the canon be applied to any other values of s and d. By reverſing the ſteps in the operation, is is eaſy to ſhow, that if $x=\frac{s+d}{2}$ and $y=\frac{s-d}{2}$, the ſum of x and y muſt be s, and their difference d.

Examp. 9. If A and B together can perform a piece of work in the time a, A and C together in the time b, and B and C together in the time c, in what time will each of them perform it alone?

Let A perform the work in the time x, B in y, and C in z; then as the work is the ſame in all caſes, it may be repreſented by unity.

Of Equations.

By the question	1	$(x:1::a:)\frac{a}{x}=$	to the work performed by A in a days
	2	$(y:1::a:)\frac{a}{y}=$	B in a days
	3	$(x:1::b:)\frac{b}{x}=$	A in b days
	4	$(z:1::b:)\frac{b}{z}=$	C in b days
	5	$(y:1::c:)\frac{c}{y}=$	B in c days
	6	$(z:1::c:)\frac{c}{z}=$	C in c days
	7	$\frac{a}{x}+\frac{a}{y}=1$ and $ay+ax=xy$	
	8	$\frac{b}{x}+\frac{b}{z}=1$ and $bz+bx=xz$	
	9	$\frac{c}{y}+\frac{c}{z}=1$ and $cz+cy=zy$	
Mult. 7th by $\frac{bc}{xy}$	10	$\frac{abc}{x}+\frac{abc}{y}=bc$	
Mult. 8th by $\frac{ac}{xz}$	11	$\frac{abc}{x}+\frac{abc}{z}=ac$	
Mult. 9th by $\frac{ab}{zy}$	12	$\frac{abc}{y}+\frac{abc}{z}=ab$	
Add 10th, 11th, 12th,	13	$\frac{2abc}{x}+\frac{2abc}{y}+\frac{2abc}{z}=bc+ac+ab$	
From 13th subt. twice 10th	14	$\frac{2abc}{z}=ac+ab-bc$ & $z=\frac{2abc}{ac+ab-bc}$	
From 13th subt. twice 11th	15	$\frac{2abc}{y}=bc+ab-ac$ & $y=\frac{2abc}{bc+ab-ac}$	
From 13th subt. twice 12th	16	$\frac{2abc}{x}=bc+ac-ab$ & $x=\frac{2abc}{bc+ac-ab}$	

Example in numbers. Let $a=8$ days, $b=9$ days, and $c=10$; then $x=14\frac{34}{49}$ $y=17\frac{23}{41}$, and $z=23\frac{7}{31}$. It appears likewise that a, b, c, must be such, that the product of any two of them must be less than the sum of these two multiplied by the third. This is necessary to give positive values of x, y, and z, which alone can take place in this question. Besides, if x, y, and z be assumed as any known numbers whatever, and if values of a, b, and c be deduced from steps 7th, 8th, and 9th, of the preceding operation, it will appear, that a, b, and c will have the property required in the limitation here mentioned.

If a, b, and c were such, that any of the quantities, x, y, or z, became equal to 0, it implies that one of the agents did nothing in the work. If the values of any of these quantities be negative, the only snpposition which could give them any meaning would be, that some of the agents, instead of promoting the work, either obstructed it, or undid it to a certain extent.

Examp. 10. In question 5th, let the first courier travel p miles in q hours; the second r miles in s hours; let the interval between their setting out be a,

Then by working as formerly,

$$x=\frac{qra}{qr-ps}.$$

Of Involution and Evolution.

If particular values be inserted for these letters, a particular solution will be obtained for that case. Let them denote the numbers in Example 5.

$$\text{Then } x=\left(\frac{qra}{qr-ps}=\frac{5\times5\times8}{5\times5-7\times3}=\frac{200}{4}=\right)50.$$

Here it is obvious, that qr must be greater than ps, else the problem is impossible; for then the value of x would either be infinite or negative. This limitation appears also from the nature of the question, as the second courier must travel at a greater rate than the first, in order to overtake him. For the rate of the first courier is to the rate of the second as $\frac{p}{q}$ to $\frac{r}{s}$, that is, as ps to qr; and therefore qr must be greater than ps.

Scholium.

Sometimes when there are many known quantities in a general solution, it may simplify the operation to express certain combinations of them by new letters, still to be considered as known.

CHAP. IV.

Of Involution and Evolution.

In order to resolve equations of the higher orders, it is necessary to premise the rules of *Involution* and *Evolution*.

LEMMA.

The reciprocals of the powers of a quantity may be expressed by that quantity, with negative exponents of the same denomination. That is, the series a, 1, $\frac{1}{a}$, $\frac{1}{a^2}$, $\frac{1}{a^3}$, $\frac{1}{a^m}$, &c. may be expressed by a^1, a^0, a^{-1}, a^{-2}, a^{-3}, a^{-m}, &c.

For the rule for dividing the powers of the same root was to subtract the exponents; if then the index of the divisor be greater than that of the dividend, the index of the quotient must be negative.

Thus, $\frac{a^2}{a^3}=a^{2-3}=a^{-1}$. Also, $\frac{a^2}{a^3}=\frac{1}{a^1}$. $\frac{a^m}{a^m}=a^{m-m}=a^0$. And, $\frac{a^m}{a^m}=1$. and so on of others.

Cor. 1. Hence any quantity which multiplies either the numerator or denominator of a fraction, may be transposed from the one to the other, by changing the sign of its index.

Thus, $\frac{x}{y^2}=xy^{-2}$. And $\frac{a^2x}{y^3}=\frac{a^2}{y^3x^{-1}}$, &c.

Cor. 2. From this notation, it is evident that these *negative powers*, as they are called, are multiplied by adding, and divided by subtracting their exponents.

Thus, $a^{-2}\times a^{-3}=a^{-5}$.

Or, $\frac{1}{a^2}\times\frac{1}{a^3}=\frac{1}{a^5}=a^{-5}$.

$\frac{a^{-1}}{a^{-3}}=a^2$ Or, $\frac{1}{a^3}\Big)\frac{1}{a}\Big(\frac{a^3}{a}=a^2$

I. *Of*

I. *Of Involution.*

To find any power of any quantity is the business of involution.

Case 1. When the quantity is simple.

Rule. Multiply the exponents of the letters by the index of the power required, and raise the coefficient to the same power.

Thus, the 2d power of a is $a^1\times^2=a^2$
The 3d power of $2a^2$ is $8a^2\times^3=8a^6$
The 3d power of $3ab^3$ is $27a^1\times^3b^3\times^3=27a^3b^9$.

For the multiplication would be performed by the continued addition of the exponents; and this multiplication of them is equivalent. The same rule holds also when the signs of the exponents are negative.

Rule for the signs. If the sign of the given quantity is $+$, all its powers must be positive. If the sign is $-$, then all its powers whose exponents are even numbers are positive; and all its powers whose exponents are odd numbers are negative.

This is obvious from the rule for the signs in multiplication.

The last part of it implies the most extensive use of the signs $+$ and $-$, by supposing that a negative quantity may exist by itself.

Case 2. When the quantity is compound.

Rule. The powers must be found by a continual multiplication of it by itself.

Thus, the square of $x+\frac{a}{2}$ is found by multiplying it into itself. The product is $x^2+ax+\frac{a^2}{4}$. The cube of $x+\frac{a}{2}$ is got by multiplying the square already found by the root, &c.

Fractions are raised to any power, by raising both numerator and denominator to that power, as is evident from the rule for multiplying fractions in Chap. I. § 2.

The involution of compound quantities is rendered much easier by the binomial theorem; for which see Chap. VI.

Note. The square of a binomial consists of the squares of the two parts, and twice the product of the two parts.

II. *Of Evolution.*

Evolution is the reverse of involution, and by it powers are resolved into their roots.

Def. The root of any quantity is expressed by placing before it $\sqrt{\ }$ (called a *radical sign*) with a small figure above it, denoting the denomination of that root.

Thus, the square root of a, is $\sqrt[2]{a}$ or $\sqrt{a}$

The cube root of bc, is $\sqrt[3]{bc}$

The 4th root of a^2b-x^3, is $\sqrt[4]{a^2b-x^3}$

The mth root of c^2-dx, is $\sqrt[m]{c^2-dx}$

General Rule for the Signs.

1. The root of any positive power may be either positive or negative, if it is denominated by an even number; if the root is denominated by an odd number, it is positive only.
2. If the power is negative, the root also is negative, when it is denominated by an odd number.
3. If the power is negative, and the denomination of the root even, then no root can be assigned.

This rule is easily deduced from that given in involution, and supposes the same extensive use of the signs $+$ and $-$. If it is applied to abstract quantities in which a contrariety cannot be supposed, any root of a positive quantity must be positive only; and any root of a negative quantity, like itself, is unintelligible.

In the last case, though no root can be affined, yet sometimes it is convenient to set the radical sign before the negative quantity, and then it is called an *impossible* or *imaginary* root.

The root of a positive power, denominated by an even number, has often the sign $\pm$ before it, denoting that it may have either $+$ or $-$.

The radical sign may be employed to express any root of any quantity whatever; but sometimes the root may be accurately found by the following rules; and when it cannot, it may often be more conveniently expressed by the methods now to be explained.

Case I. When the quantity is simple.

Rule. Divide the exponents of the letters by the index of the root required, and prefix the root of the numeral coefficient.

1. The exponents of the letters may be multiples of the index of the root, and the root of the coefficient may be extracted.

Thus, the square root of $a^4=a^{\frac{4}{2}}=\pm a^2$

$\sqrt[3]{27a^6}=3a^{\frac{6}{3}}=3a^2$

$\sqrt[4]{a^4b^{12}}=a^{\frac{4}{4}}b^{\frac{12}{4}}=\pm ab^3$.

2. The exponents of the letters may not be multiples of the index of the root, and then they become fractions; and when the root of the coefficient cannot be extracted, it may also be expressed by a fractional exponent, its original index being understood to be 1.

Thus, $\sqrt{16a^3b^2}=4a^{\frac{3}{2}}b$

$\sqrt[3]{7ax^3}=7^{\frac{1}{3}}a^{\frac{1}{3}}x=\sqrt[3]{7}\times a^{\frac{1}{3}}x$.

As evolution is the reverse of involution, the reason of the rule is evident.

The root of any fraction is found by extracting that root out of both numerator and denominator.

Case II. When the quantity is compound.

1. To extract the square root.

Rule. 1. The given quantity is to be ranged according to the powers of the letters, as in division.

Thus,

Of Involution and Evolution.

Thus, in the example $a^2+2ab+b^2$, the quantities are ranged in this manner.

2. The square root is to be extracted out of the first term (by preceding rules), which gives the first part of the root sought. Subtract its square from the given quantity, and divide the first term of the remainder by double the part already found, and the quotient is the second term of the root.

Thus, in this example, the remainder is $2ab+b^2$; and $2ab$ being divided by $2a$, the double of the part found, gives $+b$ for the second part of the root.

3. Add this second part to double of the first, and multiply their sum by the second part: Subtract the product from the last remainder, and if nothing remain, the square root is obtained. But, if there is a remainder, it must be divided by the double of the parts already found, and the quotient would give the third part of the root; and so on.

In the last example, it is obvious, that $a+b$ is the square root sought.

The entire operation is as follows.

$$\begin{array}{ll} & a^2+2ab+b^2\,(a+b \\ & a^2 \\ \hline 2a+b) & +2ab+b^2 \\ \times b) & 2ab+b^2 \\ \hline & * \end{array}$$

$$\begin{array}{ll} & x^4-ax^2+\frac{a^2}{4}\left(x^2-\frac{a}{2}\right. \\ & x^4 \\ \hline 2x^2-\frac{a}{2} & -ax^2+\frac{a^2}{4} \\ \times-\frac{a}{2} & -ax^2+\frac{a^2}{4} \\ \hline & * \end{array}$$

The reason of this rule appears from the composition of a square.

2. To extract any other root.

Rule. Range the quantity according to the dimensions of its letters, and extract the said root out of the first term, and that shall be the first member of the root required. Then raise this root to a dimension lower by unit than the number that denominates the root required, and multiply the power that arises by that number itself. Divide the second term of the given quantity by the product, and the quotient shall give the second member of the root required.—In like manner are the other parts to be found, by considering those already got as making one term.

Thus, the fifth root of

$$\begin{array}{ll} & a^5+5a^4b+10a^3b^2+10a^2b^3+5ab^4+b^5\,(a+b \\ & a^5 \\ \hline 5a^4 &)\,5a^4b \end{array}$$

And $a+b$ raised to the 5th power is the given quantity, and therefore it is the root sought.

In evolution it will often happen, that the operation will not terminate, and the root will be expressed by a series.

Thus, the square root of a^2+x^2 becomes a series.

$$\begin{array}{ll} & a^2+x^2\left(a+\frac{x^2}{2a}-\frac{x^4}{8a^3}+\frac{x^6}{16a^5}\right., \text{ \&c.} \\ & a^2 \\ \hline 2a+\frac{x^2}{2a} & *+x^2 \\ \times\frac{x^2}{2a} & =x^2+\frac{x^4}{4a^2} \\ \hline 2a+\frac{x^2}{a}-\frac{x^4}{8a^3} & *-\frac{x^4}{4a^2} \\ \times-\frac{x^4}{8a^3} & =-\frac{x^4}{4a^2}-\frac{x^6}{8a^4}+\frac{x^8}{64a^6} \\ \hline & *+\frac{x^6}{8a^4}-\frac{x^8}{64a^6}, \text{ \&c.} \end{array}$$

The extraction of roots by series is much facilitated by the binomial theorem (Chap. vi. Sect. 3.) By similar rules, founded on the same principles, are the roots of numbers to be extracted.

III. *Of Surds.*

Def. Quantities with fractional exponents are called *surds*, or *imperfect powers*.

Such quantities are also called *irrational*; in opposition to others with integral exponents, which are called *rational.*

Surds may be expressed either by the fractional exponents, or by the radical sign, the denominator of the fraction being its index; and hence the orders of surds are denominated from this index.

In the following operations, however, it is generally convenient to use the notation by the fractional exponents.

$$a^{\frac{1}{3}}=\sqrt[3]{a}.\ \sqrt{4ab^2}=2ba^{\frac{1}{2}}.\quad \sqrt[4]{a^3b^2}=a^{\frac{3}{4}}b^{\frac{2}{4}}.$$

The operations concerning surds depend on the following principle: If the numerator and denominator of a fractional exponent be both multiplied or both divided by the same quantity, the value of the power is the same. Thus $a^{\frac{m}{n}}=a^{\frac{mc}{nc}}$: for let $a^{\frac{m}{n}}=b$; then $a^m=b^n$, and $a^{mc}=b^{nc}$, and extracting the root nc, $a^{\frac{mc}{nc}}=b^{\frac{nc}{nc}}=b=a^{\frac{m}{n}}$.

Lem. A rational quantity may be put into the form of a surd, by reducing its index to the form of a fraction of the same value.

$$\text{Thus } a=a^{\frac{2}{2}}=\sqrt{a^2}$$
$$a^2b=a^{\frac{6}{3}}b^{\frac{3}{3}}=\sqrt[3]{a^6b^3}$$

Prob. I. *To reduce surds of different denominations to others of the same value and of the same denomination.*

Rule.

Of Involution and Evolution.

Rule. Reduce the fractional exponents to others of the ſame value and having the ſame common denominator.

Ex. $\sqrt{a}$, $\sqrt[3]{b^2}$ or $a^{\frac{1}{2}}$, $b^{\frac{2}{3}}$

but $a^{\frac{1}{2}}=a^{\frac{3}{6}}$ and $b^{\frac{2}{3}}=b^{\frac{4}{6}}$.

therefore $\sqrt{a}$, and $\sqrt[3]{b^2}$ are reſpectively equal to $\sqrt[6]{a^3}$ and $\sqrt[6]{b^4}$.

Prob. II. *To multiply and divide ſurds.*

1. When they are ſurds of the ſame rational quantity, add and ſubtract their exponents.

Thus, $a^{\frac{1}{3}}\times a^{\frac{3}{4}}=a^{\frac{1}{3}+\frac{3}{4}}=a^{\frac{13}{12}}=\sqrt[12]{a^{13}}$

$$\frac{\sqrt{a^2-b^2}}{\sqrt[3]{a^2-b^2}}=\frac{\overline{a^2-b^2}|^{\frac{1}{2}}}{\overline{a^2-b^2}|^{\frac{1}{3}}}=\overline{a^2-b^2}|^{\frac{1}{6}}=\sqrt[6]{a^2-b^2}.$$

2. If they are ſurds of different rational quantities, let them be brought to others of the ſame denomination, if already they are not, by prob. 1. Then, by multiplying or dividing theſe rational quantities, their product or quotient may be ſet under the common radical ſign.

Thus, $\sqrt[m]{a}\times\sqrt[n]{b}=a^{\frac{1}{m}}b^{\frac{1}{n}}=\sqrt[mn]{a^n b^m}$

$$\frac{\sqrt{a^2-b^2}}{\sqrt{a+b}}=\sqrt{\frac{a^2-b^2}{a+b}}=\sqrt{a-b}.$$

$$\frac{\sqrt[4]{a^3b^2}}{\sqrt[3]{a^2b}}=\frac{a^{\frac{3}{4}}b^{\frac{3}{4}}}{a^{\frac{2}{3}}b^{\frac{1}{3}}}=a^{\frac{3}{4}-\frac{2}{3}}b^{\frac{1}{2}-\frac{1}{3}}=a^{\frac{1}{12}}b^{\frac{1}{6}}=$$

$$a^{\frac{1}{12}}b^{\frac{2}{12}}=\sqrt[12]{ab^2}$$

If the ſurds have any rational coefficients, their product or quotient muſt be prefixed. Thus, $a\sqrt{m}\times b\sqrt{n}=ab\sqrt{mn}$. It is often convenient, in the operations of this problem, not to bring the ſurds of ſimple quantities to the ſame denomination, but to expreſs their product or quotient without the radical ſign, in the ſame manner as if they were rational quantities. Thus, the product in Ex. 1. may be $a^{\frac{1}{m}}b^{\frac{1}{n}}$, and the quotient in Ex. 3. $a^{\frac{1}{12}}b^{\frac{1}{6}}$

Cor. If a rational coefficient be prefixed to a radical ſign, it may be reduced to the form of a ſurd by the lemma, and multiplied by this problem; and converſely, if the quantity under the radical ſign be diviſible by a perfect power of the ſame denomination, it may be taken out, and its root prefixed as a coefficient.

$$a\sqrt{b}=\sqrt{a^2b};\ 2\times\sqrt[3]{a}=\sqrt[3]{8a}.$$

Conv. $\sqrt{a^2b^3}=ab\sqrt{b}$; $\sqrt{4a^2-8a^2b}=2a\sqrt{1-2b}$.

Even when the quantity under the radical ſign is not diviſible by a perfect power, it may be uſeful ſometimes to divide ſurds into their component factors, by reverſing the operation of this problem.

Thus $\sqrt{ab}=\sqrt{a}\times\sqrt{b}$, $\sqrt[3]{a^2b-bx^2}=\sqrt[3]{ba-bx}$
$\times\sqrt[3]{a+x}=b^{\frac{1}{3}}\times\sqrt[3]{a-x}\times\sqrt[3]{a+x}$.

Prob. III. *To involve or evolve Surds.*

This is performed by the ſame rules as in other quantities, by multiplying or dividing their exponents by the index of the power or root required.

The notation by negative exponents, mentioned in the lemma at the beginning of this chapter, is applicable to fractional exponents, in the ſame manner as to integers.

Scholium.

The application of the rules of this chapter to the reſolving of equations, ſhall be explained in the ſucceeding chapters, which treat of the ſolution of the different claſſes of them; but ſome examples of their uſe in preparing equations for a ſolution are the following.

If a member of an equation be a ſurd root, then the equation may be freed from any ſurd, by bringing that member firſt to ſtand alone upon one ſide of the equation, and then taking away the radical ſign from it, and raiſing the other ſide to the power denominated by the index of that ſurd.

This operation becomes a neceſſary ſtep towards the ſolution of an equation, when any of the unknown quantities are under the radical ſign.

Example. If $3\sqrt{x^2-a^2}+2y=a+y$
Then $3\sqrt{x^2-a^2}=a-y$
and $9\times x^2-a^2=a^2-2ay+y^2$

If the unknown quantity be found only under the radical ſign, and only of the firſt dimenſion, the equation will become ſimple, and may be reſolved by the preceding rules.

Thus, if $\sqrt[3]{4x+16}+5=9$
Then $\sqrt[3]{4x+16}=4$
And $4x+16=64$
$4x=48$
And $x=12$

If $\sqrt[m]{a^2x-b^2x}=a$
Then $a^2x-b^2x=a^m$
$$x=\frac{a^m}{a^2-b^2}$$

If the unknown quantity in a final equation has fractional exponents, by means of the preceding rules a new equation may be ſubſtituted, in which the exponents of the unknown quantity are integers.

Thus, if $x^{\frac{1}{2}}+3x^{\frac{2}{3}}=10$, by reducing the ſurds to the ſame denomination, it becomes $x^{\frac{3}{6}}+3x^{\frac{4}{6}}=10$; and if $z=x^{\frac{1}{6}}$, then $z^3+3z^4=10$; and if this equation be reſolved from a value of z, a value of x may be got by the rules of the next chapter. Thus alſo, if $x+2x^{\frac{1}{2}}-3x^{\frac{1}{3}}=100$. If $x^{\frac{1}{6}}=z$, this equation becomes $z^6+2z^3-3z^2=100$.

In general, if $x^{\frac{p}{q}}+x^{\frac{m}{n}}=a$. by reducing the ſurds to the ſame denomination $x^{\frac{pn}{nq}}+x^{\frac{qm}{qn}}=a$, and if $x^{\frac{1}{qn}}=z$, then the equation is $z^{pn}+z^{qm}=a$, in which the

the exponents of z are integers; and z being found, x is to be found from the equation $x^{\frac{1}{qn}}=z$.

CHAP. V.

Equations were divided into orders according to the higheſt index of the unknown quantity in any term. (chap. 3.)

Equations are either *pure* or *adfected*.

Def. 1. A *pure equation* is that in which only one power of the unknown quantity is found.

2. An *adfected equation*, is that in which different powers of the unknown quantity are found in the ſeveral terms.

Thus, $a^2+ax^2=b^3$, $ax^2-b^2=m^2+x^2$ are pure equations.

And $x^2-ax=b^2$, $x^3+x^2=17$, are adfected.

1. *Solution of pure Equations.*

Rule. Make the power of the unknown quantity to ſtand alone by the rules formerly given, and then extract the root of the ſame denomination out of both ſides, which will give the value of the unknown quantity.

EXAMPLES.

$$\text{If } a^2+ax^2=b^3 \qquad ax^m-b=x^m-c$$
$$ax^2=b^3-a^2 \qquad ax^m-x^m=b-c$$
$$x^2=\frac{b^3-a^2}{a} \qquad x^m=\frac{b-c}{a-1}$$
$$x=\sqrt{\frac{b^3-a^2}{a}} \qquad x=\sqrt[m]{\frac{b-c}{a-1}}$$

The index of the power may alſo be fractional; as in the laſt example m may be any number whatever. Let $m=\frac{1}{2}$, then as before,

$$x^m=x^{\frac{1}{2}}=\frac{b-c}{a-1}$$

$$\text{And } x=\overline{\frac{b-c}{a-1}}\Big|^2=\frac{b^2-2bc+c^2}{a^2-2a+1}.$$

Sometimes different powers of the unknown quantity are found in the equation, yet the ſeveral terms may form on one ſide a perfect power, of which the root being extracted, the equation will become ſimple.

Thus, if $x^3-12x^2+48x=98$, it is eaſy to obſerve that $x^3-12x^2+48x-64=34$; forming a complete cube; of which the root being extracted, $x-4=\sqrt[3]{34}$. And $x=4+\sqrt[3]{34}$.

Examp. 1. To find four continued proportionals, of which the ſum of the extremes is 56, and the ſum of the means 24.

To reſolve the queſtion in general terms, let the ſum of the extremes be a, the ſum of the means b, and let the difference of the extremes be called z, and the difference of the means y.

Then by Ex. 8. chap. 3.

The proportionals are	1	$\frac{a+z}{2}:\frac{b+y}{2}:\frac{b-y}{2}:\frac{a-z}{2}$.
Mult. by 2 and ſtill	2	$a+z:b+y:b-y:a-z$
From the three firſt	3	$ab-ay+bz-zy=b^2+2by+y^2$
From the three laſt	4	$ab+ay-bz-zy=b^2-2by+y^2$
3d added to 4th	5	$2ab-2zy=2b^2+2y^2$
4th ſubt. from 3d	6	$2bz-2ay=4by$
6th reduced	7	$z=\frac{2by+ay}{b}$
7th ſubſt. for z in 5th	8	$2ab-2\times\frac{2by^2+ay^2}{b}=2b^2+2y^2$
Tranſp. and divide 8th by $\frac{2}{b}$	9	$ab^2-b^3=3by^2+ay^2$
	10	$\frac{ab^2-b^3}{3b+a}=y^2$ and $y=\sqrt{\frac{ab^2-b^3}{3b+a}}$
In numbers	11	$y=\sqrt{\frac{ab^2-b^3}{3b+a}}=b\sqrt{\frac{a-b}{3b+a}}=24\sqrt{\frac{32}{128}}=12$
	12	$z=\frac{2b+a}{b}\times y=52$

Hence the four proportionals are 54, 18, 6, 2; and it appears that b muſt not be greater than a, otherwiſe the root becomes impoſſible, and the problem would alſo be impoſſible; which limitation might be deduced alſo from prop. 25. V. of Euclid.

2. *Solution of adfected Quadratic Equations.*

Adfected equations of different orders are reſolved by different rules, ſucceſſively to be explained.

An adfected quadratic equation (commonly called a quadratic) involves the unknown quantity itſelf, and alſo its ſquare: It may be reſolved by the following

Rule. 1. Tranſpoſe all the terms involving the unknown quantity to one ſide, and the known terms to the other; and ſo that the term containing the ſquare of the unknown quantity may be poſitive.

2. If the ſquare of the unknown quantity is multiplied by any coefficient, all the terms of the equation are to be divided by it, ſo that the coefficient of the ſquare of the unknown quantity may be 1.

3. Add to both ſides the ſquare of half the coefficient of the unknown quantity itſelf, and the ſide of the equation involving the unknown quantity will be a complete ſquare.

4. Extract the square root from both sides of the equation, by which it becomes simple, and by transposing the above mentioned half coefficient, a value of the unknown quantity is obtained in known terms, and therefore the equation is resolved.

The reason of this rule is manifest from the composition of the square of a binomial, for it consists of the squares of the two parts, and twice the product of the two parts. (*Note*, at the end of Chap. IV.)

The different forms of quadratic equations, expressed in general terms, being reduced by the first and second parts of the rule, are these;

1. $x^2+ax=b^2$
2. $x^2-ax=b^2$
3. $x^2-ax=-b^2$

Case 1. $x^2+ax=b^2$

$$x^2+ax+\frac{a^2}{4}=b^2+\frac{a^2}{4}$$

$$x+\frac{a}{2}=\pm\sqrt{b^2+\frac{a^2}{4}}$$

$$x=\pm\sqrt{b^2+\frac{a^2}{4}}-\frac{a}{2}$$

Case 2. $x^2-ax=b^2$

$$x^2-ax+\frac{a^2}{4}=b^2+\frac{a^2}{4}$$

$$x-\frac{a}{2}=\pm\sqrt{b^2+\frac{a^2}{4}}$$

$$x=\frac{a}{2}\pm\sqrt{b^2+\frac{a^2}{4}}$$

Case 3. $x^2-ax=-b^2$

$$x^2-ax+\frac{a^2}{4}=\frac{a^2}{4}-b^2$$

$$x-\frac{a}{2}=\pm\sqrt{\frac{a^2}{4}-b^2}$$

$$x=\frac{a}{2}\pm\sqrt{\frac{a^2}{4}-b^2}.$$

Of these cases it may be observed,

1. That if it be supposed, that the square root of a positive quantity may be either positive or negative, according to the most extensive use of the signs, every quadratic equation will have two roots, except such of the third form, whose roots become impossible.

2. It is obvious, that, in the two first forms, one of the roots must be positive, and the other negative.

3. In the third form, if $\frac{a^2}{4}$, or the square of half the coefficient of the unknown quantity, be greater than b^2, the known quantity, the two roots will be positive. If $\frac{a^2}{4}$ be equal to b^2, the two roots then become equal.

But if in this third case $\frac{a^2}{4}$ is less than b^2, the quantity under the radical sign becomes negative, and the two roots are therefore impossible. This may be easily shown to arise from an impossible supposition in the original equation.

4. If the equation, however, express the relation of magnitudes abstractly considered, where a contrariety cannot be supposed to take place, the negative roots cannot be of use, or rather there are no such roots; for then a negative quantity by itself is unintelligible, and therefore the square root of a positive quantity must be positive only. Hence, in the two first cases, there will be only one root; but in the third, there will be two. For in this third case, $x^2-ax=-b^2$, or $ax-x^2=b^2$, it is obvious that x may be either greater or less than $\frac{1}{2}a$, and yet $a-x$ may be positive; and hence $\overline{a-x}\times x=ax-x^2$ may also be positive, and may be equal to a given positive quantity b^2: therefore the square root of $x^2-ax+\frac{1}{4}a^2$ may be either $x-\frac{1}{2}a$ or $\frac{1}{2}a-x$, and both these quantities also positive.

Let then $x-\frac{a}{2}=\sqrt{\frac{a^2}{4}-b^2}$ and $x=\frac{a}{2}+\sqrt{\frac{a^2}{4}-b^2}$. Also let $\frac{a}{2}-x=\sqrt{\frac{a^2}{4}-b^2}$; and hence $x=\frac{a}{2}-\sqrt{\frac{a^2}{4}-b^2}$, and these are the same two positive roots as were obtained by the general rule.

The general rule is usually employed, even in questions where negative numbers cannot take place, and then the negative roots of the two first forms are neglected. Sometimes even only one of the positive roots of the third case can be used, and the other may be excluded by a particular condition in the question. When an impossible root arises in the solution of a question, and if it be resolved in general terms, the necessary limitation of the data will be discovered.

When a question can be so stated as to produce a pure equation, it is generally to be preferred to an adfected. Thus the question in the preceding section, by the most obvious notation, would produce an adfected equation.

2. *Solution of Questions producing Quadratic Equations.*

The expression of the conditions of the question by equations, or the stating of it, and the reduction likewise of these equations, till we arrive at a quadratic equation, involving only one unknown quantity and its square, are effected by the same rules which were given for the solution of simple equations in Chap III.

Examp. 2. One lays out a certain sum of money in goods, which he sold again for L.24, and gained as much per cent. as the goods cost him: I demand what they cost him?

If the money laid out be	1	y
The gain will be	2	$24-y$
But this gain is (y:24$-y$: :100:)	3	$\frac{2400-100y}{y}$ per cent.
Therefore by question	4	$y=\frac{2400-100y}{y}$
And by mult. and tr.	5	$y^2+100y=2400$
Completing the square	6	$\overline{y^2+100y+50}^2=2400+2500=4900$
Extr. the root	7	$y+50=\pm\sqrt{4900}=70$
Transp.	8	$y=\pm70-50=20$ or -120.

The answer is 20l. which succeeds. The other root, -120, has no place in this example, a negative number being here unintelligible.

Any quadratic equation may be resolved also by the general canons at the beginning of this section. That arising

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arising from this question, (No. 5.) belongs to Case I. and $a=100$, $b^2=2400$; therefore,

$$y=\left(-\frac{a}{2}\pm\sqrt{\frac{a^2}{4}+b^2}=\right)-\frac{100}{2}\pm\sqrt{\frac{100^2}{4}+2400}=20 \text{ or } -120 \text{ as before.}$$

Examp. 3. What two numbers are those, whose difference is 15, and half of whose product is equal to the cube of the lesser?

Let the lesser number be	1	x
The greater is	2	$x+15$
By question	3	$\frac{x^2+15x}{2}=x^3$
Divide by x and mult. by 2	4	$x+15=2x^2$
4th prepared	5	$x^2-\frac{x}{2}=\frac{15}{2}$
Complete square	6	$x^2-\frac{x}{2}+\frac{1}{16}=\frac{15}{2}+\frac{1}{16}=\frac{121}{16}$
Ext. $\sqrt{}$.	7	$x-\frac{1}{4}=\pm\frac{11}{4}$
Transp.	8	$x=3$ or $-\frac{5}{2}$

The numbers therefore are 3 and 18, which answer the conditions. This is an example of Case 2d, and the negative root is neglected.

A solution, indeed, may be represented by means of the negative root $-\frac{5}{2}$; for then the other number is $(x+15=)-\frac{5}{2}+15=\frac{25}{2}$. And $\frac{1}{2}\times\frac{25}{2}\times-\frac{5}{2}$, is equal to the cube of $-\frac{5}{2}$. Such a solution, though useless, and even absurd, it is plain must correspond to the conditions, if those rules with regard to the signs be used in the application of it, by which it was itself deduced. The same observation may be extended even to impossible roots; which being assumed as the answer of a question, must, by reversing the steps of the investigation, correspond to the original equations, by which the conditions of that question were expressed.

Examp. 4. To find two numbers whose sum is 100, and whose product is 2059.

Let the given sum $100=a$, the product $2059=b$, and let one of the numbers sought be x, the other will be $a-x$. Their product is $ax-x^2$.

Therefore by question	1	$ax-x^2=b$ or $x^2-ax=-b$
Complete the square	2	$x^2-ax+\frac{a^2}{4}=\frac{a^2}{4}-b$
Ext. $\sqrt{}$	3	$x-\frac{a}{2}=\pm\sqrt{\frac{a^2}{4}-b}$
Transp.	4	$x=\frac{a}{2}\pm\sqrt{\frac{a^2}{4}-b}$
And the other number	5	$a-x=\frac{a}{2}\mp\sqrt{\frac{a^2}{4}-b}$

By inserting numbers, $x=71$ or 29 and $a-x=29$ or 71, so that the two numbers sought are 71 and 29.

Here it is to be observed, that b must not be greater than $\frac{a^2}{4}$, else the roots of the equation would be impossible; that is, the given product must not be greater than the square of half the given sum of the numbers sought. This limitation can easily be shown from other principles; for, the greatest possible product of two parts, into which any number may be divided, is when each of them is a half of it. If b be equal to $\frac{a^2}{4}$, there is only one solution, and $x=\frac{a}{2}$, also $a-x=\frac{a}{2}$.

Examp. 5. There are three numbers in continual geometrical proportion: The sum of the first and second is 10, and the difference of the second and third is 24. What are the numbers?

Let the first be	1	z
The second will be	2	$10-z$
And the third	3	$34-z$
Since $z:10-z::10-z:34-z$	4	$z^2-20z+100=34z-z^2$
Transp.	5	$2z^2-54z=-100$
Divid.	6	$z^2-27z=-50$
Compl. the square	7	$z^2-27z+\left(\frac{27}{2}\right)^2=\frac{729}{4}-50=\frac{529}{4}$
Extract the $\sqrt{}$	8	$z-\frac{27}{2}=\pm\sqrt{\frac{529}{4}}=\pm\frac{23}{2}$
Transp.	9	$z=\frac{27}{2}\pm\frac{23}{2}=25$ or 2.

But though there are two positive roots in this equation, yet one of them only can here be of use, the other being excluded by a condition in the question. For as the sum of the first and second is 10, 25 cannot be one of them: 2 therefore is the first, and the proportionals will be 2, 8, 32.

This restriction will also appear from the explanation given of the third form, to which this equation belongs. For z may be less than $\frac{27}{2}$, but from the first condition of the question it cannot be greater; hence the quantity $z^2-27z+\left(\frac{27}{2}\right)^2$ can have only one square root, viz. $\frac{27}{2}-z$; and this being put equal to $\sqrt{\frac{529}{4}}$, we have by transposition $z=\frac{27}{2}-\frac{23}{2}=2$, which gives the only just solution of the question.

From the other root, indeed, a solution of the question may be represented by means of a negative quantity. If the first then be 25, the three proportionals will be 25, -15, 9. These also must answer the conditions, according to the rules given for negative quantities, though such a solution has no proper meaning.

Besides, it is to be observed, that if the following question be proposed, 'To find three numbers in geometrical proportion, so that the difference of the 1st and

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and 2d may be 10, and the sum of the 2d and 3d may be 24,' the equation in step 6th will be produced; for, if the 1st be z, the 2d is $z-10$, and the 3d $34-z$, and therefore $34z-z^2=z^2-20z+100$, the very same equation as in step 4th. In this question it is plain that the root 25 only can be useful, and the three proportionals are 25, 15, 9.

But the necessary limitations of such a problem are properly to be derived from a general notation. Let the sum of the two first proportionals be a, and the difference of the two last b. If a is not greater than b, the first term must be the least; but if a be greater than b, the first term must be either the greatest or the least.

When the first term is the least, the proper notation of the three terms is z, $a-z$, $a+b-z$, and the equation when ordered is $z^2-\frac{3a+b}{2}z=-\frac{a^2}{2}$. If the first term be the greatest, and then a is greater than b, the notation of the terms is z, $a-z$, $a-b-z$, and the corresponding equation is $z^2-\frac{3a-bz}{2}=-\frac{a^2}{2}$.

Of the first of these equations it may be observed, that whatever be the value of a and b, the square of $\frac{3a+b}{4}$, viz, of half the coefficient of z, is greater than $\frac{a^2}{2}$, and therefore the roots are always possible. If the square be completed, and the roots extracted, they become $z-\frac{3a+b}{4}=\frac{\sqrt{\overline{3a+b}^2-8a^2}}{4}$, and $\frac{3a+b}{4}-z=\frac{\sqrt{\overline{3a+b}^2-8a^2}}{4}$. But in this case z is the least of the three terms, and therefore a is greater than $2z$, or $\frac{a}{2}$ is greater than z; much more than is $\frac{3a+b}{4}$ greater than z; and therefore the second root only can be admitted, and $z=\frac{3a+b-\sqrt{\overline{3a+b}^2-8a^2}}{4}$ is the only proper solution.

In the second equation, since a is greater than b, $\frac{3a-b}{2}$ must be always positive, and therefore the equation is necessarily of the third form. But the roots are possible only when $\overline{\frac{3a-b}{4}}\Big|^2$, is not less than $\frac{a^2}{2}$, that is, when a^2+b^2 is not less than $6ab$, or when $a-b$ is not less than $2\sqrt{ab}$. When the roots are possible, z may be either greater or less than $\frac{3a-b}{4}$, and hence each root gives a proper solution; therefore, $z=\frac{3a-b\pm\sqrt{\overline{3a-b}^2-8a^2}}{4}$.

Ex. Let $a=40$ and $b=6$. The first term in this case may be assumed either as the greatest or the least. And, first, if z be the greatest, the roots of the equation will be possible, since $(a^2+b^2=)$ 1636 is greater than $(6ab=)$ 1440. The two values of z are 32 and 25, and the proportionals are either 32, 8, 2, or 25, 15, 9. 2*dly*, If z be assumed the least of the proportionals, the two roots of the equation are possible, but one of them only can be applied; which is 17.635 nearly; and the three proportionals are 17.635, 22.365, and 28.365, nearly, the roots of the equation being incommensurate.

In like manner may the limitations of the other question above mentioned be ascertained.

Though the preceding questions have been so contrived that the answers may be integers, yet in practice it will most commonly happen that they must be surds. When in any question the root of a number which is not a perfect square is to be extracted, it may be continued in decimals, by the common arithmetical rule, to any degree of accuracy which the nature of the subject may require.

Scholium.

An equation, in the terms of which two powers only of the unknown quantity are found, and such that the index of the one is double that of the other, may, by the preceding rules, be reduced to a pure equation, and may therefore be resolved by § 1. of this chapter.

Such an equation may generally be represented thus:

$$x^{2m}\pm ax^m=\pm b^n$$

Let $x^m=z$, then $z^2\pm az=\pm b^n$

$$\text{And } x^m\ (=z)=\mp\frac{a}{2}\pm\sqrt{\frac{a^2}{4}\pm b^n}$$

$$\text{Therefore } x=\sqrt[m]{\mp\frac{a}{2}\pm\sqrt{\frac{a^2}{4}\pm b^n}}$$

Examp. 15. To find two numbers, of which the product is 100, and the difference of their square roots 3.

Let the less be x, the greater is	1	$\frac{100}{x}$
By question	2	$\frac{10}{\sqrt{x}}-\sqrt{x}=3$
	3	$10-x=3\sqrt{x}=3x^{\frac{1}{2}}$
	4	$x+3x^{\frac{1}{2}}=10$
	5	$x+3x^{\frac{1}{2}}+\frac{9}{4}=10+\frac{9}{4}=\frac{49}{4}$
	6	$x^{\frac{1}{2}}+\frac{3}{2}=\pm\frac{7}{2}$ and $x^{\frac{1}{2}}=2$ or -5
	7	$x=4$ or $x=25$

If $x=4$, the other number is 25; and this is the proper solution, for x was supposed to be the least. In this case, indeed, the negative root of the equation being applied according to the rules for negative quantities, gives a positive answer to the question; and if $x=25$, the other number is 4.

The same would have been got, by substituting in the general theorem $m=\frac{1}{2}$, $a=3$, and $b^n=10$; or, if the less number had been called x^2, the equation would not have had fractional exponents.

CHAP. VI.

Of Indeterminate Problems.

It was formerly observed (Chap. III.), that if there are more unknown quantities in a question than equations

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tions by which their relations are expreffed, it is indetermined; or it may admit of an infinite number of anfwers. Other circumftances, however, may limit the number in a certain manner; and thefe are various, according to the nature of the problem. The contrivances by which fuch problems are refolved are fo very different in different cafes, that they cannot be comprehended in general rules.

Examp. 1. To divide a given fquare number into two parts, each of which fhall be a fquare number.

There are two quantities fought in this queftion, and there is only one equation expreffing their relation; but it is required alfo that they may be rational, which circumftance cannot be expreffed by an equation: another condition therefore muft be affumed, in fuch a manner as to obtain a folution in rational numbers.

Let the given fquare be a^2; let one of the fquares fought be x^2, the other is a^2-x^2. Let $rx-a$ alfo be a fide of this laft fquare, therefore

$$r^2x^2-2rxa+a^2=a^2-x^2$$

By tranfp. $\quad r^2x^2+x^2=2rxa$

Divide by x $\quad r^2x+x=2ra$

Therefore $\quad x=\frac{2ra}{r^2+1}$

$$\text{And } rx-a\left(=\frac{2r^2a}{r^2+1}-a\right)\frac{r^2a-a}{r^2+1}$$

Let r therefore be affumed at pleafure, and $\frac{2ra}{r^2+1}$, $\frac{r^2a-a}{r^2+1}$, which muft always be rational, will be the fides of the two fquares required.

Thus, if $a^2=100$; then if $r=3$, the fides of the two fquares are 6 and 8, for $36+64=100$.

Alfo let $a^2=64$. Then if $r=2$, the fides of the fquares are $\frac{32}{5}$ and $\frac{24}{5}$; and $\frac{1024}{25}+\frac{576}{25}=\frac{1600}{25}=64$.

The reafon of the affumption of $rx-a$ as a fide of the fquare a^2-x^2, is that being fquared and put equal to this laft, the equation manifeftly will be fimple, and the root of fuch an equation is always rational.

Examp. 2. To find two fquare numbers whofe difference is given.

Let x^2 and y^2 be the fquare numbers, and a their difference.

$$\text{Put } \frac{z+v}{2}=x, \text{ and } \frac{z-v}{2}=y$$

$$\frac{z^2+2zv+v^2}{4}=x^2$$

$$\frac{z^2-2zv+v^2}{4}=y^2$$

$$zv=(x^2-y^2=)\,a.$$

If x and y are required only to be rational, then take v at pleafure, and $z=\frac{a}{v}$, whence x and y are known.

But if x and y are required to be whole numbers, take for z and v any two factors that produce a, and are both even or both odd numbers. And this is poffible only where a is either an odd number greater than 1, or a number divifible by 4. Then $\frac{z+v}{2}$ and $\frac{z-v}{2}$ are the numbers fought.

For the product of two odd numbers is odd, and that of two even numbers is divifible by 4. Alfo, if z and v are both odd or both even, $\frac{z+v}{2}$ and $\frac{z-v}{2}$ muft be integers.

Ex. 1. If $a=27$, take $v=1$, then $z=27$; and the fquares are 196 and 169. Or z may be 9 and $v=3$, and then the fquares are 36 and 9.

2. If $a=12$, take $v=2$, and $z=6$; and the fquares are 16 and 4.

Examp. 3. To find a fum of money in pounds and fhillings, whofe half is juft its reverfe.

Note. The reverfe of a fum of money, as 8 l. 12 s. is 12 l. 8 s.

Let x be the pounds and y the fhillings.

The fum required is $20x+y$

Its reverfe is - $20y+x$

Therefore - $\frac{20x+y}{2}=20y+x$

$$20x+y=40y+2x$$

$$18x=39y$$

$$x:y::(39:18::)\ 13:6$$

In this equation there are two unknown quantities; and, in general, any two numbers of which the proportion is that of 13 to 6 will agree to it.

But, from the nature of this queftion, 13 and 6 are the only two that can give the proper anfwer, viz. 13 l. 6 s. for its reverfe 6 l. 13 s. is juft its half.

The ratio of x and y is expreffed in the loweft integral terms by 13 and 6; any other expreffion of it, as the next greater 26 and 12, will not fatisfy the problem, as 12 l. 26 s. is not a proper notation of money in pounds and fhillings.

CHAP. VII.

Demonftration of Theorems by Algebra.

ALGEBRA may be employed for the demonftration of theorems, with regard to all thofe quantities concerning which it may be ufed as an analyfis; and from the general method of notation and reafoning, it poffeffes the fame advantages in the one as in the other. The three firft fections of this chapter contain fome of the moft fimple properties of feries which are of frequent ufe; and the laft, mifcellaneous examples of the properties of algebraical quantities and numbers.

I. *Of Arithmetical Series.*

Def. When a number of quantities increafe or decreafe by the fame common difference, they form an arithmetical feries.

Thus, a, $a+b$, $a+2b$, $a+3b$, &c. x, $x-b$, $x-2b$, &c.

Alfo, 1, 2, 3, 4, 5, 6, &c. and 8, 6, 4, 2, &c.

Prop. In an arithmetical feries, the fum of the firft

 and

and last terms is equal to the sum of any two intermediate terms, equally distant from the extremes.

Let the first term be a, the last x, and b the common difference; then $a+b$ will be the second, and $x-b$ the last but one, &c.

Thus, $a,\ a+b,\ a+2b,\ a+3b,\ a+4b$, &c.
$x,\ x-b,\ x-2b,\ x-3b,\ x-4b$, &c.

It is plain, that the terms in the same perpendicular rank are equally distant from the extremes; and that the sum of any two in it is $a+x$, the sum of the first and last.

Cor. 1. Hence the sum of all the terms of an arithmetical series is equal to the sum of the first and last, taken half as often as there are terms.

Therefore if n be the number of terms, and s the sum of the series; $s=\overline{a+x}\times\frac{n}{2}$. If $a=0$, then $s=\frac{nx}{2}$.

Cor. 2. The same notation being understood, since any term in the series consists of a, the first term, together with b taken as often as the number of terms preceding it, it follows, that $x=a+\overline{n-1}\times b$, and hence $s=\overline{2a+\overline{n-1}\times b}\times\frac{n}{2}$; or by multiplication, $s=\frac{2an+n^2b-nb}{2}$. Therefore from the first term, the common difference, and number of terms being given, the sum may be found.

Ex. Required the sum of 50 terms of the series 2, 4, 6, 8, &c.

$$s=\frac{2\times2\times50+50^2\times2-50\times2}{2}=\frac{5100}{2}=2550.$$

Cor. 3. Of the first term, common difference, sum and number of terms, any three being given, the fourth may be found by resolving the preceding equation; a, b, s, and n, being successively considered as the unknown quantity. In the three first cases the equation is simple, and in the last it is quadratic.

II. *Of Geometrical Series.*

Def. When a number of quantities increase by the same multiplier, or decrease by the same divisor, they form a geometrical series. This common multiplier or divisor is called the *common ratio.*

Thus, $a,\ ar,\ ar^2$, &c. $a,\ \frac{a}{r},\ \frac{a}{r^2},\ \frac{a}{r^3}$, &c.

1, 2, 4, 8, &c.

Prop. I. The product of the extremes in a geometrical series is equal to the product of any two terms, equally distant from the extremes.

Let a be the first term, y the last, r the common ratio: then the series is,

$$a,\ ar,\ ar^2,\ ar^3,\ ar^4,\ \&c.$$
$$y,\ \frac{y}{r},\ \frac{y}{r^2},\ \frac{y}{r^3},\ \frac{y}{r^4},\ \&c.$$

It is obvious, that any term in the upper rank is equally distant from the beginning as that below it from the end; and the product of any two such is equal to ay, the product of the first and last.

Prop. II. The sum of a geometrical series wanting the first term, is equal to the sum of all but the last term multiplied by the common ratio.

For, assuming the preceding notation of a series, it is plain, that

$$ar+ar^2+ar^3,\ \&c.\ \ldots+\frac{y}{r^3}+\frac{y}{r^2}+\frac{y}{r}+y=$$
$$=r\times\overline{a+ar+ar^2,\ \&c.\ \ldots+\frac{y}{r^4}+\frac{y}{r^3}+\frac{y}{r^2}+\frac{y}{r}}$$

Cor. 1. Therefore s being the sum of the series,

$$\overline{s-y}\times r=s-a.\quad \text{And } s=\frac{yr-a}{r-1}$$

Hence s can be found from a, y, and r; and any three of the four being given, the fourth may be found.

Cor. 2. Since the exponent of r in any term is equal to the number of terms preceding it; hence in the last term its exponent will be $n-1$; the last term, therefore, $y=ar^{n-1}$, and $s=\frac{ar^n-a}{r-1}=a\times\frac{r^n-1}{r-1}$. Hence of these four, s, a, r, n, any three being given, the fourth may be found by the solution of equations. If n is not a small number, the cases of this problem will be most conveniently resolved by logarithms; and of such solutions there are examples in the appendix to this part.

Cor. 3. If the series decreases, and the number of terms is infinite; then, according to this notation, a the least term will be 0, and $s=\frac{yr}{r-1}$, a finite sum.

Ex. Required the sum of the series $1,\ \frac{1}{2},\ \frac{1}{4},\ \frac{1}{8}$, &c. to infinity.

Here $y=1$, and $r=2$. Therefore $s=\frac{1\times2}{2-1}=2$.

What are called in arithmetic *repeating* and *circulating decimals*, are truly geometrical decreasing serieses, and therefore may be summed by this rule.

Thus $.333$, &c. $=\frac{3}{10}+\frac{3}{100}+$, &c. is a geometrical series in which $y=\frac{3}{10}$ and $r=10$; therefore $s=\frac{yr}{r-1}$ $=\frac{3\times10}{10\times10-1}=\frac{1}{3}$.

Thus, also, $.2424$, &c. $=\frac{8}{33}$, for here $y=\frac{24}{100}$ and $r=100$; therefore $s=\frac{24\times100}{100\times100-1}=\frac{24}{99}=\frac{8}{33}$.

III. *Of Infinite Series.*

It was observed (Chap. I. and IV.), that in many cases, if the division and evolution of compound quantities be actually performed, the quotients and roots can only be expressed by a series of terms, which may be continued *ad infinitum*. By comparing a few of the first terms, the law of the progression of such a series

Demonstration of Theorems.

ries will frequently be discovered, by which it may be continued without any farther operation. When this cannot be done, the work is much facilitated by several methods; the chief of which is that by the binomial theorem.

THEOREM. *Any binomial (as* a+b) *may be raised to any power* (m) *by the following rules.*

1. From inspecting a table of the powers of a binomial obtained by multiplication, it appears that the terms without their coefficients are a^m, $a^{m-1}b$, $a^{m-2}b^2$, $a^{m-3}b^3$, &c.

2. The coefficients of these terms will be found by the following rule.

Divide the exponent of a in any term by the exponent of b increased by 1, and the quotient multiplied by the coefficient of that term will give the coefficient of the next following term.

This rule is found, upon trial in the table of powers, to hold universally. The coefficient of the first terms is always 1. and by applying the general rule now proposed, the coefficients of the terms in order will be as follows: $1, m, m\times\frac{m-1}{2}, m\times\frac{m-1}{2}\times\frac{m-2}{3}$, &c. They may be more conveniently expressed thus: 1, Am, B$\times\frac{m-1}{2}$, C$\times\frac{m-2}{3}$, D$\times\frac{m-3}{4}$, &c. the capitals denoting the preceding coefficient. Hence $\overline{a+b}|^m = a^m + \text{A}ma^{m-1}b + \text{B}\times\frac{m-1}{2}\times a^{m-2}b^2 + \text{C}\times\frac{m-2}{3}a^{m-3}b^3$, &c. This is the celebrated binomial theorem. It is deduced here by induction only; but it may be rigidly demonstrated, though upon principles which do not belong to this place.

Cor. 1. As m may denote any number, integral or fractional, positive or negative; hence the division, involution, and evolution, of a binomial, may be performed by this theorem.

Ex. 1. Let $m=\frac{1}{2}$, then $\overline{a+b}|^{\frac{1}{2}} = a^{\frac{1}{2}} + \frac{1}{2}a^{-\frac{1}{2}}b + \frac{1}{2}\times-\frac{1}{4}\times a^{-\frac{3}{2}}b^2+$, &c. This being applied to the extraction of the square root of a^2+x^2 (by inserting a^2 for a and x^2 for b), the same series results as formerly (Chap. IV.)

Ex. 2. If $\frac{1}{1-r}$ is to be turned into an infinite series, since $\frac{1}{1-r} = 1\times\overline{1-r}|^{-1}$, let $a=1$, $b=-r$, and $m=-1$; and the same series will arise as was obtained by division (Chap. I.)

In like manner $\frac{r^2}{\sqrt{2rz-z^2}} (=r^2\times\overline{2rz-z^2}|^{-\frac{1}{2}})$ may be expressed by an infinite series, by supposing $a=2rz$, $b=-z^2$, and $m=-\frac{1}{2}$, and then multiplying that series by r^2.

Cor. 2. This theorem is useful also in discovering the *law* of an infinite series produced by division or evolution. Thus, the series expressing the square root of a^2+x^2, consists of a, together with a series of fractions; in the numerators of which are the even powers of x, and in the denominators the odd powers of a. The numeral coefficients of the terms of the whole series, as deduced by the theorem, will be: $1, +\frac{1}{2\times1}, -\frac{1\times1}{2.2\times1.2}, +\frac{1\times1.3}{2.2.2\times1.2.3}, -\frac{1\times1.3.5}{2.2.2.2\times1.2.3.4}$, &c. the point being used (as it often is) to express the product of the numbers between which it is placed. The law of continuation is obvious; and the series may be carried on to any number of terms, without using the theorem. Hence also the coefficient of the nth term is $\frac{1\times1.3.5 \text{ \&c. . . } (n-2 \text{ terms})}{2^{n-1}\times1.2.3.4 \text{ \&c. } (n-1)}$; and it is + if n is an even number, and — if n is odd.

Note. If the binominal is $a+b$, the signs of the terms of any power are all positive; if it is $a-b$, the alternate terms are negative, beginning at the second. This theorem may be applied to quantities which consist of more than two parts, by supposing them distinguished into two, and then substituting for the powers of these compound parts their values, to be obtained also, if required, from the theorem. Thus, $\overline{a+b+c}|^2 = \overline{a+b+c}^2$.

Scholium.

An infinite series may itself be multiplied or divided by another; it may be involved or evolved; and various other operations may be performed upon it which are necessary in the higher parts of algebra. The methods for finding the sum depend upon other principles.

IV. *Properties of Numbers.*

THEOR. I. *The sum of two quantities multiplied by their difference is equal to the difference of their squares.*

Let the quantities be represented by a and b, then $\overline{a+b}\times\overline{a-b}=a^2-b^2$, as appears by performing the operation.

Cor. If a and b be any two quantities of which the sum may be denoted by s, the difference by d, and their product by p, then the following propositions will be true.

1. $a^2+b^2=s^2-2p$ 2. $a^2-b^2=sd$
3. $a^3+b^3=s^3-3ps$ 4. $a^3-b^3=s^2d-dp$
5. $a^4+b^4=s^4-4ps^2+2p^2$ 6. $a^4-b^4=s^3d-2sdp$, &c.

It is unnecessary to express these propositions in words, and the demonstrations are very easy, by raising $a+b$ to certain powers, and making proper substitutions.

THEOR. II. *The sum of any number of terms* (n) *of the odd numbers* 1, 3, 5, *&c. beginning with* 1, *is equal to the square of that number* (n).

In the rule for summing an arithmetical series, let $a=1$, $b=2$, and $n=n$, and the sum of this series will be $s=\frac{2an+n^2b-nb}{2}=\frac{2n^2}{2}=n^2$. Q. E. D.

5

THEOR.

Demonſtration of Theorems.

THEOR. III. *The difference of any two ſquare numbers is equal to the ſum of the two roots, together with twice the ſum of the numbers in the natural ſcale between the two roots.*

Let the one number be p, and the other $p+n$, the intermediate numbers are $p+1$, $p+2$, . . . &c. $p+n-1$. The difference of the ſquares of the given numbers is $2pn+n^2$; the ſum of the two roots is $2p+n$, and twice the ſum of the ſeries $\overline{p+1}+\overline{p+2}$ . . . &c. $\overline{p+n-1}$ is (by Cor. 1. 1ſt Sect. of this Chap.) $2s=\overline{2p+n}\times\overline{n-1}$, viz. the ſum of the firſt and laſt multiplied by the number of terms, and it is plain that $2p+n+\overline{2p+n}\times\overline{n-1}=2pn+n^2$. Therefore, &c.

Lem. 1. Let r be any number, and n any integer, r^n-1 is diviſible by $r-1$.

The quotient will be $r^{n-1}+r^{n-2}$, &c. till the index of r be 0, and then the laſt term of it will be 1; for if this ſeries be multiplied by the diviſor $r-1$, it will produce the dividend r^n-1. It will appear alſo by performing the diviſion, and inſerting for n any number.

Lem. 2. Let r be any number, and n any integer odd number, r^n+1 is diviſible by $r+1$. Alſo, if n is any even number, r^n-1 is diviſible by $r+1$.

The quotient in both caſes is $r^{n-1}-r^{n-2}+r^{n-3}$ &c. till the exponent of r be 0, and the laſt term $r^0=1$. If this ſeries conſiſt of an odd number of terms, and be multiplied by $r+1$ the diviſor, the product is r^n+1 the dividend. If the ſeries conſiſt of an even number of terms, the product is r^n-1; but it is plain that the number of terms will be odd only when n is odd, and even only when n is even. The concluſion will be manifeſt by performing the diviſion.

Lem. 3. If r is the root of an arithmetical ſcale, any number in that ſcale may be repreſented in the following manner, a, b, c, &c. being the coefficients or digits, $a+br+cr^2+dr^3+er^4$, &c.

THEOR. IV. *If from any number in the general ſcale now deſcribed, the ſum of its digits be ſubtracted, the remainder is diviſible by* $r-1$.

The number is $a+br+cr^2+dr^3$, &c. and the ſum of the digits is $a+b+c+d$, &c. Subtracting the latter from the former, the remainder is $br-b+cr^2-c+dr^3-d$, &c. $=b\overline{r\times-1}+c\times\overline{r^2-1}+d\times\overline{r^3-1}$, &c. But (by Lem. 1.) r^n-1 is diviſible by $r-1$, whatever integer number n may be, and therefore any multiple of r^n-1 is alſo diviſible by $r-1$: Hence each of the terms, $b\times\overline{r-1}$, $c\times\overline{r^2-1}$, &c. is diviſible by $r-1$, and therefore the whole is diviſible by $r-1$.

Cor. 1. Any number, the ſum of whoſe digits is diviſible by $r-1$, is itſelf diviſible by $r-1$. Let the number be called N, and the ſum of the digits D; then by this prop. $N-D$ is diviſible by $r-1$, and D is ſuppoſed to be diviſible by $r-1$; therefore it is plain that N muſt alſo be diviſible by $r-1$.

Cor. 2. Any number, the ſum of whoſe digits is diviſible by an aliquot part of $r-1$, is alſo diviſible by that aliquot part. For, let N and D denote as before; and ſince $N-D$ (Theor. 4.) is diviſible by $r-1$, it is alſo diviſible by an aliquot part of $r-1$; but D is diviſible by an aliquot part of $r-1$, therefore N is alſo diviſible by that aliquot part.

Cor. 3. This theorem, with the corollaries, relates to any ſcale whatever. It includes therefore the well known property of 9 and of 3 its aliquot part, in the decimal ſcale; for, ſince $r=10$, $r-1=9$.

THEOR. V. *In any number, if from the ſum of the coefficients of the odd powers of* r *the ſum of the coefficients of the even powers be ſubtracted, and the remainder added to the number itſelf, the ſum will be diviſible by* $r+1$.

In the number $a+br+cr^2+dr^3+er^4+fr^5$, &c. the ſum of the coefficients of the odd powers of r is $b+d+f$, &c. the ſum of the coefficients of the even powers of r is $a+c+e$, &c. If the latter ſum be ſubtracted from the former, and the remainder added to the given number, it makes $br+b+cr^2-c+dr^3+d+er^4-e+fr^5+f$, &c. $=b\times\overline{r+1}+c\times\overline{r^2-1}+d\times\overline{r^3+1}+e\times\overline{r^4-1}+f\times\overline{r^5+1}$, &c. But (by Lem. 2.) $r+1$, r^2-1, r^3+1, &c. are each diviſible by $r+1$, and therefore any multiples of them are alſo diviſible by $r+1$, hence the whole number is diviſible by $r+1$.

Cor. 1. If the difference of the ſum of the even digits, and the ſum of the odd digits of any number be diviſible by $r+1$, the number itſelf is diviſible by $r+1$.

Let the ſum of the even digits (that is, the coefficients of the odd powers of r) be D, the ſum of the odd digits be d, and let the number be N. Then by the theorem $N+D-d$ is diviſible by $r+1$, and it is ſuppoſed that $D-d$ is diviſible by $r+1$; therefore N is diviſible by $r+1$.

Cor. 2. In like manner, if $D-d$ is diviſible by an aliquot part of $r+1$, N will be diviſible by that aliquot part.

Cor. 3. If a number want all the odd powers of r, or if it want all the even powers of r, and if the ſum of its digits be diviſible by $r+1$, that number is diviſible by $r+1$.

Cor. 4. In the common ſcale $r+1=11$, which therefore will have the properties mentioned in this theorem, and the corollaries. Thus, in the number 64,834, the ſum of the even digits is 7, the ſum of the odd digits is 18, and the difference is 11, a number diviſible by 11, the given number therefore (Cor. 1.) is diviſible by 11. Thus alſo, the ſum of the digits of 7040308 is diviſible by 11, and therefore the number is diviſible by 11. (Cor. 3.)

Scholium.

Theſe theorems relate to any ſcale whatever, and therefore the properties of $r-1$ in Theor. 4. would in a ſcale of *eight* belong to *ſeven*, and thoſe in Theor. 5. to *nine*. If *twelve* was the root of the ſcale, the former properties would belong to *eleven*, and the latter to *thirteen*.

APPENDIX to PART I.

ALGEBRA may be employed in expreſſing the relations of magnitude in general, and in reaſoning with regard to them. It may be uſed in deducing not only the relations of number, but alſo thoſe of extenſion, and hence thoſe of every ſpecies of quantity expreſſible by numbers or extended magnitudes. In this appendix are mentioned ſome examples of its application to other parts of mathematics, to phyſics, and to the

Application to Geometry.

the practical calculations of bufinefs. The principles and fuppofitions peculiar to thefe fubjects, which are neceffary in directing both the algebraical operations, and the conclufions to be drawn from them, are here affumed as juft and proper.

I. *Application of Algebra to Geometry.*

Algebra has been fuccefsfully applied to almoft every branch of mathematics; and the principles of thefe branches are often advantageoufly introduced into algebraical calculations.

The application of it to *geometry* has been the fource of great improvement in both thefe fciences; on account of its extent and importance it is here omitted, and the principles of it are more particularly explained in the third part of thefe elements.

In this place fhall be given an example of the ufe of logarithms in refolving certain algebraical queftions.

Note. When logarithms are ufed, let ($l.$) denote the logarithm of any quantity before which it is placed.

Ex. To find the number of terms of a geometrical feries, of which the fum is 511, the firft term 1, and the common ratio 2.

From fect. 2. chap. 6. it appears that $s=\frac{ar^n-a}{r-1}$, and in this problem, s, r, and a are given, and n is to be found. By reducing the equation $r^n=\frac{s\times\overline{r-1}+a}{a}$ and from the known property of logarithms $n\times l.r=\overline{l.s\times\overline{r-1}+a}-l.a$, and $n=\frac{l.s\times\overline{r-1}+a-l.a.}{l.r}$ But here $s=511$, $a=1$, $r=2$, and $n=\frac{l.512}{l.2}=\frac{2.7092700}{0.3010300}=9.$

In like manner may any fuch equation be refolved, when the only unknown quantity is an exponent, and when it is the exponent only of one quantity.

Ex. 2. An equation of the following quadratic form $a^2\pm 2ba^x=\pm c$ may be refolved by logarithms. 1ft, by fcholium of Chap. V. $a^x=\pm b\pm\sqrt{b^2\pm c}.$ And then x is difcovered in the fame manner as in the preceding example. Thus, let $a=2$, $b=10$, and $c=96$ and the equation $2^{2x}-20\times 2^x=-96$. 1ft, $2^x=10\pm\sqrt{4}=12$ or 8. If $2^x=8$ then $x=\frac{l.8}{l.2}=3$ and $2^6-20\times 2^3=-96$ is a true equation. If $2^x=12$, then $x=\frac{l.12}{l.2}=\frac{1.0791812}{0.3010300}=3.5849$, and this number being inferted for x in the given equation, by means of logarithms, will anfwer the conditions.

Ex. 3. The fum of 2000l. has been out at intereft for a certain time, and 500l. has been at intereft double of that time, the whole arrear now due reckoning 4 *per cent.* compound intereft, is 6000l. What were the times?

By the rules in the third part of this appendix for compound intereft, it is plain that if $R=1.04$, and the time at which the 2000l. is at intereft be x, the arrear of it will be $2000\times R^x$. The arrear of the 500l. is $500\times R^{2x}$, hence $500\times R^{2x}+2000\times R^x=6000$. This refolved gives $R^x=2$ and $x=\frac{l.2}{l.R}=17.67$, + nearly, that is, 17 years and 8 months nearly, and the double is 35 years and 4 months; which anfwer the conditions.

Application to Physics.

II. *Application of Algebra to Phyfics.*

Phyfical quantities which can be divided into parts, that have proportions to each other, the fame as the proportions of lines to lines, or of numbers to numbers, may be expreffed by lines and numbers, and therefore by algebraical quantities. Hence thefe mathematical notations may be confidered as the meafures of fuch phyfical quantities; they may be reafoned upon according to the principles of algebra, and from fuch reafonings, new relations of the quantities which they reprefent may be difcovered.

In thofe branches of natural philofophy, therefore, in which the circumftances of the phenomena can be properly expreffed by numbers, or geometrical magnitudes, algebra may be employed, both in promoting the inveftigation of phyfical laws by experience, and alfo in deducing the neceffary confequences of laws inveftigated and prefumed to be juft.

It is to be obferved likewife, that if various hypothefes be affumed concerning phyfical quantities, without regard to what takes place in nature, their confequences may be demonftratively deduced, and thus a fcience may be eftablifhed, which may be properly called *mathematical.* The ufe of algebra in this fcience, which is fometimes called *Theoretical Mechanics*, is obvious from the principles already laid down.

In conducting thefe inquiries, it is to be obferved, that, for the fake of brevity, the language of algebraical operations is often ufed with regard to phyfical quantities themfelves; though it is always to be underderftood, that, in ftrict propriety, it can be applied only to the mathematical notations of thefe quantities.

Before illuftrating this application of algebra by examples, it may be proper to explain a method of ftating the proportion of variable quantities, and reafoning with regard to it, which is of general ufe in natural philofophy.

1. *Of the Proportion of variable Quantities.*

Mathematical quantities are often fo connected, that when the magnitude of one is varied, the magnitudes of the others are varied, according to a determined rule. Thus, if two ftraight lines, given in pofition, interfect each other; and, if a ftraight line, cutting both, moves parallel to itfelf, the two fegments of the given lines between their interfection and the moving line, however varied, will always have the fame proportion. Thus alfo, if an ordinate to the diameter of a parabola move parallel to itfelf, the abfcifs will be increafed or diminifhed in proportion as the fquare of the ordinate is increafed or diminifhed.

In like manner may algebraical quantities be connected. If x, y, z, &c. reprefent any variable quantities, while a, b, c, reprefent fuch as are conftant or invariable, then an equation containing two or more variable quantities, with any number of conftant quantities, will exhibit a relation of variable quantities, fimilar to thofe already mentioned. Thus, if $ax=by$, then $x:y::b:a$, that is, x has a conftant proportion to y, in

in whatever way these two quantities may be varied. Likewise, if $xy^2=a^2b$, then $y^2:a^2::b:x$, or $y^2:\frac{1}{x}::a^2:\frac{1}{b}$, that is, y^2 has a constant proportion to the reciprocal of x, or y^2 is increased in the same proportion as x is diminished, and conversely. It is necessary to premise the following definitions.

Definitions.

Let there be any number of variable quantities, X, Y, Z, V, &c. connected in such a manner, that when X becomes x, Y, Z, V, &c. becomes respectively y, z, v, &c. And let a, b, c, &c. represent any constant quantities, whether given or unknown. Then

1. If two variable quantities X and Y are so connected, that whatever be the values of x and y, $X:x::Y:y$, this proportion is expressed thus, $X=Y$, and X is said to be *directly as* Y, or shortly, X is said to be *as* Y.

2. If two variable quantities X and Y are so connected, that $X:x::y:Y$, or $X:x::\frac{1}{Y}:\frac{1}{y}$, their relation is thus expressed, $X=\frac{1}{Y}$; and X is said to be *inversely*, or *reciprocally as* Y.

3. If X, Y, Z, are three variable quantities, so connected that $X:x::YZ:yz$, their relation is so expressed, $X=YZ$, and X is said to be *directly as* Y and Z, *jointly*; or X is said to be as Y and Z.

4. If any number of variable quantities as X, Y, Z, V, &c. are so connected, that $XY:xy::\frac{YZ}{V}:\frac{yz}{v}$; then $XY=\frac{YZ}{V}$, and XY is said to be directly as YZ, and inversely as V, or more explicitly, X and Y *jointly*, are *directly as* Y *and* Z *jointly*, and *inversely as* V.

In like manner are other combinations of variable qualities denoted and expressed.

It is to be observed also, the same definitions take place, when the variable quantities are multiplied or divided by any constant quantities. Thus, if $aX:ax::\frac{b}{Y}:\frac{b}{y}$ then $aX=\frac{b}{Y}$, &c.

5. Let the preceding notation of proportion be called a *proportional equation* (A), the equations formerly treated of being in this place, for the sake of distinction, called *absolute*.

Cor. Every absolute equation, containing more than one variable quantity, may be considered as a proportional equation; and in a proportional equation, if at any particular corresponding values of the variable quantities, the equation becomes absolute, it will be universally absolute.

Prop. 1. If one side of a proportional equation be either multiplied or divided by any constant quantity, it will continue to be true. Thus, if $X=\frac{1}{Y}$, then $X=\frac{a^2}{bY}$. For since $X=\frac{1}{Y}$ (Def. 3.) $X:x::\frac{1}{Y}:\frac{1}{y}$, it follows, (Chap. II.) that $X:x::\frac{a^2}{bY}:\frac{a^2}{by}$, therefore (Def. 4.) $X=\frac{a^2}{bY}$.

Prop. 2. If the two sides of a proportional equation be both multiplied, or both divided by the same quantity, it will continue to be true.

1st, If the quantity be constant, it is manifest from Prop. 1.

2d, If the quantity be variable, let $X=Y$, and Z a variable quantity, then $XZ=YZ$. For, since $X=Y$, (Def. 2.) $X:x::Y:y$; multiply the antecedents by Z, and the consequents by z, then $XZ:xz::YZ:yz$, therefore (Def. 5.) $XZ=YZ$. In like manner, if $X=Y$, $\frac{X}{Z}=\frac{Y}{Z}$.

Cor. Any variable quantity, which is a factor of one side of a proportional equation, may be made to stand alone. Thus, if $XY=\frac{Z}{V}$, then $X=\frac{Z}{VY}$; also, $Z=XYV$; and $Y=\frac{Z}{XV}$, and also $V=\frac{Z}{XY}$, &c. Hence, also, if one side of a proportional equation be divided by the other, the quotient is a constant quantity, *viz.* 1.

Prop. 3. If two proportional equations have a common side, the remaining two sides will form a proportional equation. Also, that common side will be *as* the sum or difference of the other two.

Thus, if $X=Y$, and $Y=Z$, then $X=Z$. For $X:x::Y:y$, and $Y:y::Z:z$, therefore multiplying these ratios, $XY:xy::YZ:yz$, and by dividing antecedents and consequents, $X:x::Z:z$, therefore (Def. 2.) $X=z$.

Likewise, if $X=Y$, and $Y=Z$, $Y=X\pm Z$. For, since $X:x::Y:y::Z:z$. (Chap. II.) $Y:y::X\pm Z:x\pm z$, therefore Def. 5. $Y=X\pm Z$.

Cor. Hence, one side of a proportional equation will be *as* the sum, or *as* the difference of the two sides; and the sum of the two sides will be *as* their difference. Thus, if $X=Y+Z$, then $X=X+Y+Z$ and $X=X-Y-Z$, and also $X+Y+Z=X-Y-Z$.

Prop. 4. If the two sides of a proportional equation be respectively multiplied or divided by the two sides of any other proportional equation, the products or quotients will form a proportional equation.

Thus, if $X=Y$, and $Z=V$, then $XZ=YV$. For since $X:x::Y:y$, and $Z:z::V:v$, by multiplying these proportions (Chap. I. II.) $XZ:xz::YV:yv$, therefore (Def. 5.) $XZ=YV$. In like manner in the case of division.

Cor. 1. The two sides of a proportional equation may be raised to any power, or any root may be extracted out of both, and the equation will continue to be true.

Thus, if $X=Y$, then $X^m=Y^m$; for since $X=Y$,

(A) These terms are used only with a view to give more precision to the ideas of beginners. In order to avoid the ambiguity in the meaning of the sign $=$, some writers employ the character $\propto$, to denote constant proportion; but this is seldom necessary, as the quantities compared are generally of different kinds, and the relation expressed is sufficiently obvious. See Emerson's Mathematics, vol. I.

$X:x::Y:y$, and therefore $X^m:x^m::Y^m:y^m$; therefore $X^m=Y^m$. And, if $X=Y$, also $X^{\frac{1}{m}}=Y^{\frac{1}{m}}$.

Cor. 2. If two proportional equations have a common side, that side will be *as* the square root of the product of the other two. Thus if $X=Y$, and $Y=Z$, by this Prop. $Y^2=XZ$, and (Cor. 1.) $Y=\sqrt{XZ}$. Hence also, in this case, $\sqrt{XZ}=X\pm Z$; for (Prop. 3.) $Y=X\pm Z$.

Cor. 3 If one side of a proportional equation be a factor of a side of another proportional equation, the remaining side of the former may be inserted in the latter, in place of that factor. Thus, if $X=ZY$, and $Z=\frac{1}{V}$, then $X=\frac{Y}{V}$, as appears by multiplying the two equations, and dividing by Z.

Prop. 5. Any proportional equation may be made absolute, by multiplying one side by a constant quantity.

Thus, if $X=Y$, then let two particular corresponding values of these variable quantities be assumed as constant, and let them be a and b, then $X:a::Y:b$, and $Xb=aY$, or $X=Y\times\frac{a}{b}$, an absolute equation.

Scholium.

1. If there be two variable physical quantities, either of the same, or of different kinds, which are so connected, that when the one is increased or diminished, the other is increased or diminished in the same proportion; or, if the magnitudes of the one, in any two situations, have the same ratio to each other, as the magnitudes of the other in the corresponding situations, the relation of the mathematical measure of these quantities may be expressed by a proportional equation, according to Def. 1.

2. If two variable physical quantities be so connected, that the one increases in the same proportion as the other is diminished, and conversely; or, if the magnitudes of the one, in any two situations, be reciprocally proportional to the magnitudes of the other, in the corresponding situations, the relation of their measures may be expressed by a proportional equation, according to Def. 2.

3. If three variable physical quantities are so connected, that one of them is increased or diminished, in proportion as both the others are increased or diminished; or, if the magnitudes of one of them, in any two situations, have a ratio which is compounded of the ratios of the magnitudes of the other two, in the corresponding situations; the relation of the measures of these three may be expressed by a proportional equation, according to Def. 3.

4. In like manner may the relations of other combinations of physical quantities be expressed according to Def. 4. And when these proportional equations are obtained, by reasoning with regard to them, according to the preceding propositions, new relations of the physical quantities may be deduced.

2. *Examples of Physical Problems.*

The use of algebra, in natural philosophy, may be properly illustrated by some examples of physical problems. The solution of such problems must be derived from known physical laws, which, though ultimately founded on experience, are here assumed as principles, and reasoned upon mathematically. The experiments by which the principles are ascertained admit of various degrees of accuracy; and on the degree of physical accuracy in the principles will depend the physical accuracy of the conclusions mathematically deduced from them. If the principles are inaccurate, the conclusions must, in like manner, be inaccurate; and, if the limits of inaccuracy in the principles can be ascertained, the corresponding limits, in the conclusions derived from them, may likewise be calculated.

Examp. 1. Let a glass tube, 30 inches (a) long, be filled with mercury, excepting 8 inches (b); and let it be inverted as in the Toricellian experiment, so that the 8 inches of common air may rise to the top: It is required to find at what height the mercury will remain suspended, the mercury in the barometer being at that time 28 inches (d) high.

The solution of this problem depends upon the following principles:

1. The pressure of the atmosphere is measured by the column of mercury in the barometer; and the elastic force of the air, in its natural state, which resists this pressure, is therefore measured by the same column.

2. In different states, the elastic force of the air is reciprocally as the spaces which it occupies.

3. In this experiment, the mercury which remains suspended in the tube, together with the elastic force of the air in the top of it, being a counterbalance to the pressure of the atmosphere, may therefore be expressed by the column of mercury in the barometer.

Let the mercury in the tube be x inches, the air in the top of it occupies now the space $a-x$; it occupied formerly b inches, and its elastic force was d inches of mercury: Now, therefore, the force must be ($a-x:b::d:$) $\frac{bd}{a-x}$ inches. (2.) Therefore (3.) $x+\frac{bd}{a-x}=d$. This reduced, and putting $a+d=2m$ the equation is $x^2-2mx=bd-ad$.

This resolved gives $x=m\pm\sqrt{m^2+bd-ad}$.

In numbers - - $x=44$ or 14.

One of the roots 44 is plainly excluded in this case, and the other, 14, is the true answer. If the column of mercury x, suspended in the tube, were a counterbalance to the pressure of the atmosphere, expressed by the height of the barometer d, together with the measure of the elastic force of b inches of common air in the space $x-a$, that is, if $x=d+\frac{bd}{x-a}$, or $x-\frac{bd}{x-a}=d$, the equation will be the same as before, and the root 44 would be the true answer. But the experiment in this question does not admit of such a supposition.

Examp. 2. The distance of the earth and moon (d), and their quantities of matter (t, l), being given, to find the point of equal attraction between them.

Let the distance of the point from the earth be x: Its distance from the moon will be therefore $d-x$. But gravitation is *as* the matter *directly*, and *as* the square of the distance *inversely*; therefore the earth's attraction is *as* $\frac{t}{x^2}$; and the moon's attraction is *as* $\frac{l}{(d-x)^2}$. But these are here equal; therefore,

$$\frac{t}{x^2}=\frac{l}{\overline{d-x}|^2} \text{ and } \frac{\sqrt{t}}{x}=\frac{\sqrt{l}}{d-x}$$

This equation reduced gives $x=\frac{d\sqrt{t}}{\sqrt{t}+\sqrt{l}}$

Or mult. numerator and denominator by $\sqrt{t}-\sqrt{l}$ $\Big\} \; x=\frac{dt-d\sqrt{tl}}{t-l}$

In round numbers, let $d=60$ semidiameters of the earth, $t=40$, $l=1$, then $x=52$ semidiameters nearly. There is another point beyond the moon at which the attractions are equal, and it would be found by putting the square root of $\overline{d-x}|^2$ to be $x-d$, which, in this case, would be a positive quantity; and then $x=\frac{dt+d\sqrt{tl}}{t-l}$ $=72$ nearly. If the quantities had been multiplied before extracting the square roots, the adfected quadratic would have given the same two roots.

Examp. 3. Let a stone be dropt into an empty pit; and let the time from the dropping of it to the hearing the sound from the bottom be given: To find the depth of the pit.

Let the given time be a; let the fall of a heavy body in the 1st second of time (16.122 feet) be b: also, let the motion of sound in a second (1142 feet) be c.

Let the time of the stone's fall be -	1	x
The time in which the sound of it moves to the top is - -	2	$a-x$
The descent of a falling body is as the square of the time, therefore the depth of the pit is $(1^2:x^2::b:)$ -	3	bx^2
The depth from the motion of sound is also - - -	4	$ca-cx$
Therefore 3 and 4 - -	5	$bx^2=ca-cx$

This equation being resolved, gives the value of x, and from it may be got bx^2 or $ca-cx$, the depth of the pit.

If the time is 10'', then $x=8.885$ nearly, and the depth is 1273 feet.

There are several circumstances in this problem which render the conclusion inaccurate.

1. The values of c and b, on which the solution is founded, are derived from experiments, which are subject to considerable inaccuracies.

2. The resistance of the air has a great effect in retarding the descent of heavy bodies, when the velocity becomes so great as is supposed in this question; and this circumstance is not regarded in the solution.

3. A small error, in making the experiment to which this question relates, produces a great error in the conclusion. This circumstance is particularly to be attended to in all physical problems; and, in the present case, without noticing the preceding imperfections, an error of half a second, in estimating the time, makes an error of above 100 feet in the expression of the depth of the pit.

III. *Of Interest and Annuities.*

The application of algebra to the calculation of interests and annuities, will furnish proper examples of its use in business. Algebra cannot determine the propriety or justice of the common suppositions on which these calculations are founded, but only the necessary conclusions resulting from them.

Notation.

In the following theorems let p denote any principal sum of which 1 l. is the unit, t the time during which it bears interest, of which one year shall be the unit, r the rate of interest of 1 l. for one year, and let s be the amount of the principal sum p with its interest for the time t at the rate r.

I. *Of Simple Interest.*

$s=p+ptr$, and of these four, s, p, t, r, any three being given, the fourth may be found by resolving a simple equation.

The foundation of the canon is very obvious; for the interest of 1 l. in one year is r, for t years it is tr, and for p pounds it is ptr; the whole amount of principal and interest must therefore be $p+ptr=s$.

II. *Of Compound Interest.*

When the simple interest at the end of every year is supposed to be joined to the principal sum, and both to bear interest for the following year, money is said to bear compound interest. The same notation being used, let $1+r=R$. Then $s=pR^t$.

For the simple interest of 1 l. in a year is r, and the new principal sum therefore which bears interest during the second year is $(1+r=)\ R$; the interest of R for a year is rR, and the amount of principal and interest at the end of the 2d year, is $R+rR=R\times\overline{1+r}=R^2$. In like manner, at the end of the 3d year it is R^3, and at the end of t years it is R^t, and for the sum p it is $pR^t=s$.

Cor. 1. Of these four p, R, t, s, any three being given the 4th may be found. When t is not very small, the solution will be obtained most conveniently by logarithms. When R is known r may be found, and conversely.

Ex. If 500 l. has been at interest for 21 years, the whole arrear due, reckoning $4\frac{1}{2}$ per cent. compound interest, is 1260.12 l. or 1260 l. 2s. 5d. In this case $p=500$, $R=1.045$ and $t=21$ and $s=1260.12$, and any one of these may be derived by the theorem from the others being known. Thus, to find s; $l.R^t=t\times l.R=21\times0.0191\ 163=0.4014423$, therefore $R^t=2.520242$ and $s=(pR^t=)\ 500\times2.520242=1260.121$.

Cor. 2. The present worth of a sum (s) in reversion that is payable after a certain time t is found thus. Let the present worth be x, then this money improved by compound interest during t produces xR^t, which must be equal to s, and if $xR^t=s$, $x=\frac{s}{R^t}$.

Cor. 3. The time in which a sum is doubled at compound interest will be found thus. $pR^t=2p$ and $R^t=2$ and $t=\frac{l.\ 2}{l.\ R}$; thus, if the rate is 5 per cent. $r=.05$ and

$\frac{l.\ 2}{l.\ 1.05}=\frac{0.3010300}{0.0211893}=14.2066$, that is 14 years and 75 days nearly.

Scholium.

Many other suppositions might be made with regard to the improvement of money by compound interest. The interest might be supposed to be joined to the capital, and along with it to bear interest at the end of every

every month, at the end of every day, or even at the end of every instant, and suitable calculations might be formed; but these suppositions, being seldom used in practice, are omitted.

III. *Of Annuities.*

An annuity is a payment made annually for a certain term of years, and the chief problem with regard to it is, 'to determine its present worth.' The supposition on which the solution proceeds is, that the money received by the seller, being improved by him in a certain manner during the continuance of the annuity, amounts to the same sum as the several payments received by the purchaser, improved in the same manner. The suppositions with regard to the improvement may be various. What is called the *method of simple interest*, in which simple interest only is reckoned upon the purchase-money, and simple interest on each annuity from the time of payment, is so manifestly unequitable, as to be universally rejected; and the supposition which is now generally admitted in practice, is the highest improvement possible on both sides, viz. by compound interest. As the taking compound interest is prohibited by law, the realizing of this supposed improvement requires punctual payment of interest, and therefore the interest in such calculations is usually made low. Even with this advantage, it can hardly be rendered effectual in its full extent; it is however universally acquiesced in, as the most proper foundation of general rules; and when peculiar circumstances require any different hypothesis, a suitable calculation may be made.

Let then the annuity be called a, and let p be the present worth of it or purchase-money, t the time of its continuance, and let the other letters denote as formerly.

The seller, by improving the price received p, at compound interest, at the time the annuity ceases, has pR^t.

The purchaser is supposed to receive the first annuity a at the end of the first year, which is improved by him for $t-1$ years; it becomes therefore (Th. 2.) aR^{t-1}.

He receives the 2d annuity at the end of the 2d year, and when improved $t-2$, it becomes aR^{t-2}.

The third annuity becomes aR^{t-3}, &c.

The last annuity is simply a, therefore the whole amount of the improved annuities is the geometrical series $a+aR+aR^2$, &c. .. aR^{t-1}. The sum of this series, by Chap. VI. Sect. 2. is $a\times\frac{R^t-1}{R-1}=a\times\frac{R^t-1}{r}$.

But, from the nature of the problem, $pR^t=a\times\frac{R^t-1}{r}$,

and hence $p=a\times\frac{R^t-1}{rR^t}=a\times\frac{1-\frac{1}{R^t}}{r}$.

The same conclusion results from calculating the present worth of the several annuities, considered as sums payable in reversion.

Cor. 1. Of these four p, a, R, t, any three being given, the fourth may be found, by the solution of equations; t is found easily by logarithms, R or r can be found only by resolving an adfected equation of the t order.

Cor. 2. If an annuity has been unpaid for the term t, the arrear, reckoning compound interest, will be $a\times\frac{R^t-1}{r}$.

Cor. 3. The present worth of an annuity in reversion, that is to commence after a certain time (n), and then to continue t years, is found by subtracting the present worth for n years from the present worth for $n+t$ years, and then

$$p=a\times\frac{R^t-1}{rR^{t+n}}=a\times\frac{1-\frac{1}{R^t}}{rR^n}.$$

Also of R, t, n, a, p, any four being given, the fifth may be found.

Cor. 4. If the annuity is to continue for ever, then R^t-1 and R^t may be considered as the same; and $p=a\times\frac{R^t-1}{rR^t}=\frac{a}{r}$.

Cor. 5. A perpetuity in reversion (by *Cor.* 3.) since $R^t-1=R^t$, is $p=\frac{a}{rR^n}$.

Prob. When 12 years of a lease of 21 were expired, a renewal for the same term was granted for 1000l.; 8 years are now expired, and for what sum must a corresponding renewal be made, reckoning 5 *per cent.* compound interest?

From the first transaction the yearly profit rent must be deduced; and from this the proper fine in the second may be computed.

In the first bargain, an annuity in reversion for 12 years, to commence 9 years hence, was sold for 1000l. the annuity will therefore be found by *Cor.* 3. in which all the quantities are given, but $a=p\times\frac{rR^n}{1-\frac{1}{R^t}}$.

and by inserting numbers, viz. $p=1000$, $t=12$, $n=9$, $r=.05$, and $R=1.05$; and working by logarithms $a=175.029=175$l.—7d.

Next, having found a, the second renewal is made by finding the present worth of the annuity a in reversion, to commence 13 years hence, and to last 8 years. In the canon (*Cor.* 3.) insert for a 175.029, and let $t=8$, $n=13$, and $r=.05$ as before, $p=599{,}93=599$ l. 18s. 6½d. The fine required.

As these computations often become troublesome, and are of frequent use, all the common cases are calculated in tables, from which the value of any annuity, for any time, at any interest, may easily be found.

It is to be observed also, that the preceding rules are computed on the supposition of the annuities being paid yearly; and therefore, if they be supposed to be paid half yearly, or quarterly, the conclusions will be somewhat different, but they may easily be calculated on the preceding principles.

The calculations of life annuities, depend partly upon the principles now explained, and partly on physical principles, from the probable duration of human life, as deduced from bills of mortality.

PART

P A R T II.

Of the General Properties and Refolution of EQUATIONS of all Orders.

CHAP. I.

Of the Origin and Compofition of Equations; and of the Signs and Coefficients of their Terms.

IN order to refolve the higher orders of equations, and to inveftigate their general affections, it is proper firft to confider their origin from the combination of inferior equations.

As it would be impoffible to exhibit particular rules for the folution of every order of equations, their number being indefinite; there is a neceffity of deducing rules from their general properties, which may be equally applicable to all.

In the application of algebra to certain fubjects, and efpecially to geometry, there may be an oppofition in the quantities, analogous to that of addition and fubtraction, which may therefore be expreffed by the figns $+$ and $-$. Hence thefe figns may be underftood by abftraction, to denote contrariety in general; and therefore, in this method of treating of equations, negative roots are admitted as well as pofitive. In many cafes the negative will have a proper and determinate meaning; and when the equation relates to magnitude only, where contrariety cannot be fuppofed to exift, thefe roots are neglected, as in the cafe of quadratic equations formerly explained. There is befides this advantage in admitting negative roots, that both the properties of equations from which their refolution is obtained, and alfo thofe which are ufeful in the many extenfive applications of algebra, become more fimple and general, and are more eafily deduced.

In this general method, all the terms of any equation are brought to one fide, and the equation is expreffed by making them equal to o. Therefore, if a root of the equation be inferted inftead of (x) the unknown quantity, the pofitive terms will be equal to the negative, and the whole muft be equal to o.

Def. When any equation is put into this form, the term in which (x) the unknown quantity, is of the higheft power, is called the *Firft;* that in which the index of x is lefs by 1, is the *Second,* and fo on, till the laft into which the unknown quantity does not enter, and which is called the *Abfolute* Term.

Prop. I. If any number of equations be multiplied together, an equation will be produced, of which the dimenfion (A) is equal to the fum of the dimenfions of the equations multiplied.

If any number of fimple equations be multiplied together, as $x-a=0$, $x-b=0$, $x-c=0$, &c. it is obvious, that the product will be an equation of a dimenfion, containing as many units as there are fimple equations. In like manner, if higher equations are multiplied together, as a cubic and a quadratic, one of the fifth order is produced, and fo on.

Converfely. An equation of any dimenfion is confidered as compounded either of fimple equations, or of others, fuch that the fum of their dimenfions is equal to the dimenfion of the given one. By the refolution of equations thefe inferior equations are difcovered, and by inveftigating the component fimple equations, the roots of any higher equation are found.

Cor. 1. Any equation admits of as many folutions, or has as many roots as there are fimple equations which compofe it, that is, as there are units in the dimenfion of it.

Cor. 2. And converfely, no equation can have more roots than the units in its dimenfion.

Cor. 3. Imaginary or impoffible roots muft enter an equation by pairs; for they arife from quadratics, in which both the roots are fuch.

Hence alfo, an equation of an even dimenfion may have all its roots, or any even number of them impoffible, but an equation of an odd dimenfion muft at leaft have one poffible root.

Cor. 4. The roots are either pofitive or negative, according as the roots of the fimple equations, from which they are produced, are pofitive or negative.

Cor. 5. When one root of an equation is difcovered, one of the fimple equations is found, from which the given one is compounded. The given equation, therefore, being divided by this fimple equation, will give an equation of a dimenfion lower by 1. Thus, any equation may be depreffed as many degrees as there are roots found by any method whatever.

Prop. II. To explain the general properties of the figns and coefficients of the terms of an equation.

Let $x-a=0$, $x-b=0$, $x-c=0$, $x-d=0$, &c. be fimple equations, of which the roots are any pofitive quantities $+a$, $+b$, $+c$, $+d$, &c. and let $x+m=0$, $x+n=0$, &c. be fimple equations, of which the roots are any negative quantities $-m$, $-n$, &c. and let any number of thefe equations be multiplied together, as in the following table:

$$\begin{array}{l} x-a=0 \\ \times x-b=0 \\ \hline \left.\begin{array}{l} =x^2-ax \\ \quad -bx+ab \end{array}\right\} =0\text{, a Quadratic.} \\ \times x-c=0 \\ \hline \end{array}$$

(A) The term *dimenfion,* in this treatife, is ufed in fenfes fomewhat different, but fo as not to create any ambiguity. In this chapter it means either the order of an equation, or the number denoting that order, which was formerly defined to be the higheft exponent of the unknown quantity in any term of the equation.

$$\left.\begin{array}{r}=x^3-a\\-b\\-c\end{array}\right\}+x^2\left.\begin{array}{r}+ab\\+ac\\+bc\end{array}\right\}\times x-abc=0\text{, a Cubic.}$$

$$\times x+m=0$$

$$\left.\begin{array}{r}=x^4-a\\-b\\-c\\+m\end{array}\right\}\times x^3\left.\begin{array}{r}+ab\\+ac\\+bc\\-am\\-bm\\-cm\end{array}\right]\times x^2\left.\begin{array}{r}-abc\\+abm\\+acm\\+bcm\end{array}\right\}\times x-abcm=0\text{, a (Biquadratic,}$$

&c.

From this table it is plain,

1. That in a complete equation the number of terms is always greater by unit than the dimension of the equation.

2. The coefficient of the first term is 1.

The coefficient of the second term is the sum of all the roots (a, b, c, m, &c.) with their signs changed.

The coefficient of the third term is the sum of all the products that can be made by multiplying any two of the roots together.

The coefficient of the fourth term is the sum of all the products which can be made by multiplying together any three of the roots with their signs changed; and so of others.

The last term is the product of all the roots, with their signs changed.

3. From induction it appears, that in any equation (the terms being regularly arranged as in the preceding example) there are as many positive roots as there are changes in the signs of the terms from + to —, and from — to +; and the remaining roots are negative. The rule also may be demonstrated.

Note. The impossible roots in this rule are supposed to be either positive or negative.

In this example of a numeral equation $x^4-10x^3+35x^2-50x+24=0$, the roots are, +1, +2, +3, +4, and the preceding observations with regard to the signs and coefficients take place.

Cor. If a term of an equation is wanting, the positive and negative parts of its coefficient must then be equal. If there is no absolute term, then some of the roots must be $=0$, and the equation may be depressed by dividing all the terms by the lowest power of the unknown quantity in any of them. In this case also, $x-0=0$, $x-0=0$, &c. may be considered as so many of the component simple equations, by which the given equation being divided, it will be depressed so many degrees.

CHAP. II.

Of the Transformation of Equations.

There are certain transformations of equations necessary towards their solution; and the most useful are contained in the following propositions.

Prop. 1. The affirmative roots of an equation become negative, and the negative become affirmative, by changing the signs of the alternate terms, beginning with the second.

Thus the roots of the equation $x^4-x^3-19x^2+49x-30=0$ are +1, +2, +3, −5, whereas the roots of the equation $x^4+x^3-19x^2-49x-30=0$, are −1, −2, −3, +5.

The reason of this is derived from the composition of the coefficients of these terms, which consist of combinations of odd numbers of the roots, as explained in the preceding Chapter.

Prop. 2. An equation may be transformed into another that shall have its roots greater or less than the roots of the given equation by some given difference.

Let x be the unknown quantity of the equation, and e the given difference; let $y=x\pm e$, then $x=y\mp e$; and if for x and its powers in the given equation, $y\mp e$ and its powers be inserted, a new equation will arise, in which the unknown quantity is y, and its value will be $x\pm e$; that is, its roots will differ from the roots of the given equation by e.

Let the equation proposed be $x^3-px^2+qx-r=0$, of which the roots must be diminished by e. By inserting for x and its powers $y+e$ and its powers, the equation required is,

$$\left.\begin{array}{r}y^3+3ey^2+3e^2y+e^3\\-py^2-2pey-pe^2\\+qy+qe\\-r\end{array}\right\}=0.$$

Cor. 1. From this transformation, the second, or any other intermediate term, may be taken away; granting the resolution of equations.

Since the coefficients of all the terms of the transformed equation, except the first, involve the powers of e and known quantities only, by putting the coefficient of any term equal to 0, and resolving that equation, a value of e may be determined; which being substituted, will make that term to vanish.

Thus, in this example, to take away the second term, let its coefficient, $3e-p=0$, and $e=\frac{1}{3}p$, which being substituted for e, the new equation will want the second term. And universally, the coefficient of the first term of a cubic equation being 1, and x being the unknown quantity, the second term may be taken away by supposing $x=y\mp\frac{1}{3}p$, $\pm p$ being the coefficient of that term.

Cor. 2. The second term may be taken away by the solution of a simple equation, the third by the solution of a quadratic, and so on.

Cor. 3. If the second term of a quadratic equation be taken away, it will become a pure equation, and thus a solution of quadratics will be obtained, which coincides with the solution already given in Part I.

Cor. 4. The last term of the transformed equation is the same with the given equation, only having e in place of x.

Prop. 3. In like manner may an equation be transformed into another, of which the roots shall be equal to the roots of the given equation, multiplied or divided by a given quantity.

Let x be the unknown letter in the given equation, and y that of the equation wanted; also let e be the given quantity.

To multiply the roots let $xe=y$, and $x=\frac{y}{e}$.

To divide the roots let $\frac{x}{e}=y$, and $x=ye$.

Then

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Then ſubſtitute for x and its powers, $\frac{y}{e}$ or ye and its powers, and the new equation of which y is the unknown quantity will have the property required.

Cor. 1. By this propoſition an equation, in which the coefficient of the firſt term is any known quantity, as a, may be transformed into another, in which the coefficient of the firſt term ſhall be unit. Thus, let the equation be $ax^3—px^2+qx—r=0$. Suppoſe $y=ax$, or $x=\frac{y}{a}$, and for x and its powers inſert $\frac{y}{a}$ and its powers, and the equation becomes $\frac{y^3}{a^2}—\frac{py^2}{a^2}+\frac{qy}{a}—r=0$, or $y^3—py^2+qay—a^2r=0$. Alſo, let the equation be $5x^3—6x^2+7x—30=0$; and if $x=\frac{y}{5}$, then $y^3—6y^2+35y—750=0$.

Cor. 2. If the two transformations in Prop. 2. and 3. be both required, they may be performed either ſeparately or together.

Thus, if it is required to transform the equation $ax^3—px^2+qx—r=0$ into one which ſhall want the ſecond term, and in which the coefficient of the firſt term ſhall be 1; let $x=\frac{y}{a}$, and then $y^3—py^2+qay—a^2r=0$ as before; then let $y=z+\frac{1}{3}p$, and the new equation, of which z is the unknown quantity, will want the ſecond term, and the coefficient of z^3, the higheſt term is 1. Or, if $x=\frac{z+\frac{1}{3}p}{a}$, the ſame equation as the laſt found will ariſe from one operation.

Ex. Let the equation be $5x^3—6x^2+7x—30=0$. If $x=\frac{y}{5}$, then $y^3—6y^2+35y—750=0$. And if $y=z+2$, $z^3+23z—696=0$. Alſo, at once, let $x=\frac{z+2}{5}$, and the equation properly reduced, by bringing all the terms to a common denominator, and then caſting it off, will be $z^3+23z—696=0$, as before.

Cor. 3. If there are fractions in an equation, they may be taken away, by multiplying the equation by the denominators, and by this propoſition the equation may then be transformed into another, without fractions, in which the coefficient of the firſt term is 1. In like manner may a ſurd coefficient be taken away in certain caſes.

Cor. 4. Hence alſo, if the coefficient of the ſecond term of a cubic equation is not diviſible by 3, the fractions thence ariſing in the transformed equation, wanting the ſecond term, may be taken away by the preceding corollary. But the ſecond term alſo may be taken away, ſo that there ſhall be no ſuch fractions in the transformed equation, by ſuppoſing $x=\frac{z\mp p}{3}$, $\pm p$ being the coefficient of the ſecond term of the given equation. And if the equation $ax^3—px^2+qx—r=0$ be given, in which p is not diviſible by 3, by ſuppoſing $x=\frac{z+p}{3a}$, the transformed equation reduced is $z^3—\overline{3p^2+9aq}.\times z—2p^3+9apq—27a^2r=0$; wanting the ſecond term, having 1 for the coefficient of the firſt term, and the coefficients of the other terms being all integers, the coefficients of the given equation being alſo ſuppoſed integers.

General Corollary to Prop. 1. 2. 3.

If the roots of any of theſe transformed equations be found by any method, the roots of the original equation, from which they were derived, will eaſily be found from the ſimple equations expreſſing their relation. Thus, if 8 is found to be a root of the transformed equation $z^3+23z—696=0$ (Cor. 2. prop. 3.) Since $x=\frac{z+2}{5}$, the correſponding root of the given equation $5x^3—6x^2+7x—30=0$ muſt be $\frac{8+2}{5}=2$. It is to be obſerved alſo, that the reaſoning in Prop. 2. and 3. and the corollaries, may be extended to any order of equations, though in them it is applied chiefly to cubics.

CHAP. III.

Of the Reſolution of Equations.

From the preceding principles and operations, rules may be derived for reſolving equations of all orders.

I. Cardan's *Rule for Cubic Equations.*

The ſecond term of a cubic equation being taken away, and the coefficient of the firſt term being made 1, (by Cor. 1. Prop. 2. and Cor. 1. Prop. 3. Chap. II.) it may be generally repreſented by $x^3{}_*+3qx+2r=0$; the ſign + in all terms denoting the addition of them, with their proper ſigns. Let $x=m+n$, and alſo $mn=—q$; by the ſubſtitution of theſe values, an equation of the 6th order, but of the quadratic form, is deduced, which gives the values of m and n; and hence,

$$(m+n=)\ x=\sqrt[3]{—r+\sqrt{r^2+q^3}}+\sqrt[3]{—r—\sqrt{r^2+q^3}};$$

$$\text{or } x=\sqrt[3]{—r+\sqrt{r^2+q^3}}—\frac{q}{\sqrt[3]{—r+\sqrt{r^2+q^3}}}.$$

Cor. 1. In the given equation, if $3q$ is negative, and if r^2 is leſs than q^3, this expreſſion of the root involves impoſſible roots; while, at the ſame time, all the roots of that equation are poſſible. The reaſon is, that in this method of ſolution it is neceſſary to ſuppoſe that x the root may be divided into two parts, of which the product is q. But it is eaſy to ſhow, that in this, which is called the *irreducible caſe*, it cannot be done.

For example, the equation (Ex. 3. Sect. 3. of this Chapter), $x^3—156x+560=0$, belongs to the irreducible caſe, and the three roots are $+4$, $+10$, $—14$; and it is plain that none of theſe roots can be divided into two parts (m and n), of which the product can be equal to $(—q=)\frac{156}{3}=52$; for the greateſt product from the diviſion of the greateſt root $—14$, is $—7\times—7=49$ leſs than 52.

If the cube root of the compound ſurd can be extracted, the impoſſible parts balance each other, and the true root is obtained.

The geometrical problem of the triſection of an

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arch is resolved algebraically, by a cubic equation of this form; and hence the foundation of the rule for resolving an equation belonging to this case, by a table of sines.

Cor. 2. Biquadratic equations may be reduced to cubics, and may therefore be resolved by this rule.

Some other classes of equations, too, may be resolved by particular rules; but these, and every other order of equations, are commonly resolved by the general rules, which may be equally applied to all.

II. *Solution of Equations, whose Roots are commensurate.*

Rule 1. All the terms of the equation being brought to one side, find all the divisors of the absolute term, and substitute them successively in the equation for the unknown quantity. That divisor which, substituted in this manner, gives the result $=0$, shall be a root of the equation.

Ex. 1. $\left.\begin{array}{l} x^3-3ax^2+2a^2x-2a^2b \\ -bx^2+3abx \end{array}\right\}=0.$

The simple literal divisors of $-2a^2b$ are a, b, $2a$, $2b$, any of which may be inserted for x. Supposing $x=+a$, the equation becomes

$\left.\begin{array}{l} a^3-3a^3+2a^3-2a^2b \\ -ba^2+3a^2b \end{array}\right\}$ which is obviously $=0$.

Ex. 2. $x^3-2x^2-33x+90=0$.

The divisors of 90 are 1, 2, 3, 5, 6, 9, 10, 15, 18, 30, 45, 90.

The first of these divisors, which being inserted for x, will make the result $=0$, is $+3$; $+5$ is another; and it is plain the last root must be negative, and it is -6.

When 3 is discovered to be a root, the given equation may be divided by $x-3=0$, and the result will be a quadratic, which being resolved will give the other two roots, $+5$ and -6.

The reason of the rule appears from the property of the absolute term formerly defined, viz. that it is the product of all the roots.

To avoid the inconvenience of trying many divisors, this method is shortened by the following

Rule 2. Substitute in place of the unknown quantity successively three or more terms of the progression, 1, 0, -1, &c. and find all the divisors of the sums that result; then take out all the arithmetical progressions that can be found among these divisors whose common difference is 1, and the values of x will be among those terms of the progressions which are the divisors of the result arising from the substitution of $x=0$. When the series increases, the roots will be positive; and when it decreases, the roots will be negative.

Examp. Let it be required to find a root of the equation $x^3-x^2-10x+6=0$.

The operation is thus:

Supposit.		*Result.*	*Divisors.*	*Ar. pro.*
$x=1$	- - -	-4	1, 2, 4,	4
$x=0$	$x^3-x^2-10x+6=$	$+6$	1, 2, 3, 6,	3
$x=-1$	- - -	$+14$	1, 2, 7, 14,	2

In this example there is only one progression, 4, 3, 2; and therefore 3 is a root, and it is -3, since the series decreases.

It is evident from the rules for transforming equations (Chap. II.), that by inserting for x, $+1$ $(=+e)$ the result is the absolute term of an equation of which the roots are less than the roots of the given equation by 1 $(=e)$. Cor. 4. Prop. 2. When $x=0$ the result is the absolute term of the given equation. When for x is inserted -1 $(=-e)$ the result is the absolute term of an equation whose roots exceed the roots of the given equation by 1 $(=e)$. Hence, if the terms of the series 1, 0, -1, -2, &c. be inserted successively for x, the results will be the absolute terms of so many equations, of which the roots form an increasing arithmetical series with the difference 1. But as the commensurate roots of these equations must be among the divisors of their absolute terms, hence they must be among the arithmetical progressions found by this rule. The roots of the given equation therefore are to be sought for among the terms of these progressions which are divisors of the result, upon the supposition of $x=0$, because that result is its absolute term.

It is plain that the progressions must always be increasing, only it is to be observed, that a decreasing series with the sign $+$ becomes increasing with the sign $-$. Thus, in the preceding example, -4, -3, -2, is an increasing series, of which -3 is to be tried, and it succeeds.

If, from the substitution of three terms of the progression, 1, 0, -1, &c. there arise a number of arithmetical serieses, by substituting more terms of that progression, some of the serieses will break off, and, of course, fewer trials will be necessary.

III. *Examples of Questions producing the higher Equations.*

Examp. 1. It is required to divide 16l. between two persons, so that the cube of the one's share may exceed the cube of the other's by 386.

Let the greater share be x pounds,
And the less will be $16-x$;

By the question, $x^3-\overline{16-x}|^3=386$

And by Inv. $2x^3-48x^2+768x-4096=386$

Transp. and divide $x^3-24x^2+384x-2241=0$.

Suppos.	*Results.*	*Divisors.*
If $x=1$; -	1880 -	1, 2, 4, 5, 8, 10, 20,
$x=0$; -	2241 -	1, 3, 9, 27, 83.
$x=-1$; -	2650 -	1, 2, 5, 10, 25, 53.

Where 8, 9, 10, differ by 1; therefore $+9$ is to be tried; and being inserted for x, the equation is $=0$. The two shares then are 9 and 7 which succeed.

Since

Of Equations.

Since $x=9$; $x-9=0$, is one of the simple equations from which this cubic is produced, therefore $\frac{x^3-24x^2+384x-2241}{x-9}=x^2-15x+249=0$. And the two roots of this quadratic are impossible.

Examp. 2. What two numbers are those whose product multiplied by the greater will produce 405, and their difference multiplied by the less 20?

Let the greater number be x, and the less y.

Then by quest. $\begin{cases}(xy\times x=)x^2y=405\\(x-y\times y=)xy-y^2=20\end{cases}$

Therefore - - - - $x=\frac{y^2+20}{y}$

And - - - - - - $x^2=\frac{y^4+40y^2+400}{y^2}$

Also - - - - - - $x^2=\frac{405}{y}$

Therefore $\frac{y^4+40y^2+400}{y^2}=\frac{405}{y}$

Mult. and transp. $y^4+40y^2-405y+400=0$.

This biquadratic, resolved by divisors, gives $y=5$: and therefore $x=9$. Also $\frac{y^4+40y^2-405y+400}{y-5}=y^3+5y^2+65y-80=0$.

This cubic equation has one positive incommensurate root, viz. 1.114, &c. which may be found by the rule in the next section, and two impossible. The incommensurate root $y=1.114$, &c. gives $x=19.067$, &c. and these two answer the conditions very nearly.

Examp. 3. The sum of the squares of two numbers 208, and the sum of their cubes 2240 being given, to find them.

Let the greater be $x+y$, and the less $x-y$.

Then $\overline{x+y}|^2+\overline{x-y}|^2=2x^2+2y^2=208$

Hence $y^2=104-x^2$

Also $\overline{x+y}|^3+\overline{x-y}|^3=2x^3+6xy^2=2240$

Substitute for y^2 its value and $2x^3+624x-6x^3=2240$.

This reduced gives $x^3-156x+560=0$.

The roots of this equation are $+10$, $+4$, -14. If $x=10$, then $y=2$; and the numbers sought are 12 and 8, which give the only just solution. If $x=4$, then $y^2=88$ and $y=\sqrt{88}$. The numbers sought are therefore $4+\sqrt{88}$ and $4-\sqrt{88}$. The last is negative, but they answer the conditions. Lastly, if $x=-14$, then $y^2=-92$, hence $y=\sqrt{-92}$, is impossible; but still the two numbers $-14+\sqrt{-92}$, $-14-\sqrt{-92}$, being inserted, would answer the conditions. But it has been frequently observed, that such solutions are both useless and without meaning.

IV. *Solution of Equations by Approximation.*

By the former rules, the roots of equations, when they are commensurate, may be obtained. These, however, more rarely occur; and when they are incommensurate, we can find only an approximate value of them, but to any degree of exactness required. There are various rules for this purpose; one of the most simple is that of Sir Isaac Newton, which shall be now explained.

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Lemma. If any two numbers, being inserted for the unknown quantity (x) in any equation, give results with opposite signs, an odd number of roots must be between these numbers.

This appears from the property of the absolute term, and from this obvious maxim, that if a number of quantities be multiplied together, and if the signs of an odd number of them be changed, the sign of the product is changed. For, when a positive quantity is inserted for x, the result is the absolute term of an equation whose roots are less than the roots of the given equation by that quantity (Prop. 2. Cor. 3. Chap. II.). If the result has the same sign as the given absolute term, then from the property of the absolute term (Prop. 2. Chap. I.) either none or an even number only of the positive roots, have had their signs changed by the transformation; but if the result has an opposite sign to that of the given absolute term, the signs of an odd number of the positive roots must have been changed. In the first case, then, the quantity substituted must have been either greater than each of an even number of the positive roots of the given equation, or less than any of them; in the second case, it must have been greater than each of an odd number of the positive roots. An odd number of the positive roots, therefore, must lie between them when they give results with opposite signs. The same observation is to be extended to the substitution of negative quantities and the negative roots.

From this lemma, by means of trials, it will not be difficult to find the nearest integer to a root of a given numeral equation. This is the first step towards the approximation; and both the manner of continuing it, and the reason of the operation, will be evident from the following example.

Let the equation be $x^3-2x-5=0$.

1. Find the nearest integer to the root. In this case a root is between 2 and 3; for these numbers being inserted for x, the one gives a positive, and the other a negative, result. Either the number above the root, or that below it, may be assumed as the first value; only it will be more convenient to take that which appears to be nearest to the root, as will be manifest from the nature of the operation.

2. Suppose $x=2+f$, and substitute this value of x in the equation.

$$\begin{aligned}x^3&=\ 8+12f+6ff+f^3\\-2x&=-4-2f\\-5&=-5\\\hline x^3-2x-5&=-1+10f+6f^2+f^3=0.\end{aligned}$$

As f is less than unit, its powers f^2 and f^3 may be neglected in this first approximation, and $10f=1$, or $f=0.1$ nearly, therefore $x=2.1$ nearly.

3. As $f=0.1$ nearly, let $f=.1+g$, and insert this value of f in the preceding equation.

$$\begin{aligned}f^3&=\ 0.001+0.03g+0.3g^2+g^3\\6f^2&=\ 0.06+1.2g+6.g^2\\10f&=\ 1\quad+10g\\-1&=-1\\\hline f^3+6f^2+10f-1&=\ 0.061+11.23g+6.3g^2+g^3=0\end{aligned}$$

and neglecting g^2 and g^3 as very small $0.61+1123g=0$,

Application to Geometry.

$=0$, or $g=\frac{-0.061}{11.23}=-.0054$, hence $f=0.1+g=.0946$ nearly, and $x=2.0946$ nearly.

4. This operation may be continued to any length, as by supposing $g=-.0054+h$, and so on, and the value of $x=2.09455147$ nearly.

By the first operation a nearer value of x may be found thus; since $f=.1$ nearly and $-1+10f+6f^2+f^3=0$, $f=\frac{1}{10+6f+f^2}$, that is, $f=\frac{1}{10+.6+.01}=.094$ true to the last figure, and $x=2.094$.

Application to Geometry.

In the same manner may the root of a pure equation be found, and this gives an easy method of approximating to the roots of numbers which are not perfect powers.

This rule is applicable to numeral equations of every order; and, by assuming a general equation, general rules may be deduced for approximating to the roots of any proposed equation. By a similar method we may approximate to the roots of literal equations, which will be expressed by infinite series.

PART III.

Of the Application of ALGEBRA to GEOMETRY.

CHAP. I.

General Principles.

GEOMETRY treats both of the magnitude and position of extension, and their connections.

Algebra treats only of magnitude; therefore, of the relations which subsist in geometrical figures, those of magnitude only can be immediately expressed by algebra.

The opposite position of straight lines may indeed be expressed simply by the signs + and —. But, in order to express the various other positions of geometrical figures by algebra from the principles of geometry, some relations of magnitude must be found, which depend upon these positions, and which can be exhibited by equations: And, conversely, by the same principles may the positions of figures be inferred from the equations denoting such relations of their parts.

Though this application of algebra appears to be indirect, yet such is the simplicity of the operations, and the general nature of its theorems, that investigations, especially in the higher parts of geometry, are generally easier and more expeditious by the algebraical method, though less elegant than by what is purely geometrical. The connections also, and analogies of the two sciences established by this application, have given rise to many curious speculations. Geometry has been rendered far more extensive and useful, and algebra itself has received considerable improvements.

I. *Of the Algebraical Expression of Geometrical Magnitudes.*

A *line*, whether known or unknown, is represented by a single letter: a *rectangle* is properly expressed by the product of the two letters representing its sides: and a *rectangular parallelopiped* by the product of three letters; two of which represent the sides of any of its rectangular bases, and the third the altitude.

These are the most simple expressions of geometrical magnitudes; and any other which has a known proportion to these, may in like manner be expressed algebraically. Conversely, the geometrical magnitudes, represented by such algebraical quantities, may be found, only the algebraical dimensions above the third, not having any corresponding geometrical dimensions, must be expressed by proportionals (A).

The opposite position of straight lines, it has been remarked, may be expressed by the signs + and —.

Thus, let a point A be given in the line

p   A   M   P   B

AP, any segment AP taken to the right hand being considered as positive, a segment Ap to the left is properly

(A) All algebraical dimensions above the third must be expressed by inferior geometrical dimensions; and though any algebraical quantities of two or three dimensions may be immediately expressed by surfaces and solids respectively, yet it is generally necessary to express them, and all superior dimensions, by lines.

If, in any geometrical investigation by algebra, each line is expressed by a single letter, and each surface or solid by an algebraical quantity of two or three dimensions respectively, then whatever legitimate operations are performed with regard to them, the terms in any equation derived will, when properly reduced, be all of the same dimension; and any such equation may be easily expressed geometrically by means of proportionals, as in the following example.

Thus, if the algebraical equation $a^4+b^4=c^4-d^4$, is to be expressed geometrically, a, b, c, and d, being supposed to represent straight lines; let $a:b:e:f:g$, in continued proportion, then $a^4:b^4::a:g$ and $a^4:a^4+b^4::a:a+g$; then let $a:c:h:k:l$, and $a^4:c^4::a:l$; also, let $c:d:m:n:p$, and $c^4:d^4::c:p$, or $c^4:c^4-d^4::c:c-p$. By combining the two former proportions (Chap. II. Part I.), $c^4:a^4+b^4::l:a+g$, and combining the latter with this last found, $c^4-d^4:a^4+b^4::\overline{c-p}\times l:c\times\overline{a+g}$; therefore $\overline{c-p}\times l=c\times\overline{a+g}$, and $c:c-p::l:a+g$.

If

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perly reprefented by a negative quantity. If a and b reprefent two lines; and if, upon the line AB from the point A, AP be taken towards the right equal to a, it may be expreffed by $+a$; then PM taken to the left and equal to b, will be properly reprefented by $-b$, for AM is equal to $a-b$. If $a=b$, then M will fall upon A, and $a-b=0$. By the fame notation, if b is greater than a, M will fall to the left of A; and in this cafe, if $2a=b$, and if Pp be taken equal to b, then $(a-b=)-a$ will reprefent Ap, which is equal to a, and fituated to the left of A. This ufe of the figns, however, in particular cafes, may be precluded, or in fome meafure reftrained.

The pofitions of geometrical figures are fo various, that it is impoffible to give general rules for the algebraical expreffion of them. The following are a few examples.

An angle is expreffed by the ratio of its fine to the radius; a right angle in a triangle, by putting the fquares of the two fides equal to the fquare of the hypothenufe; the pofition of points is afcertained by the perpendiculars from them on lines given in pofition; the pofition of lines by the angles which they make with given lines, or by the perpendiculars on them from given points; the fimilarity of triangles by the proportionality of their fides which gives an equation, &c.

Thefe and other geometrical principles muft be employed both in the demonftration of theorems and in the folution of problems. The geometrical propofition muft firft be expreffed in the algebraical manner, and the refult after the operation muft be expreffed geometrically.

II. *The Demonftration of Theorems.*

All propofitions in which the proportions of magnitudes only are employed, alfo all propofitions expreffing the relations of the fegments of a ftraight line, of their fquares, rectangles, cubes, and parallelopipeds, are demonftrated algebraically with great eafe. Such demonftrations, indeed, may in general be confidered as an abridged notation of what are purely geometrical.

This is particularly the cafe in thofe propofitions which may be geometrically deduced without any conftruction of the fquares, rectangles, &c. to which they refer. From the firft propofition of the fecond book of Euclid, the nine following may be eafily derived in this manner, and they may be confidered as proper examples of this moft obvious application of algebra to geometry.

If certain pofitions are either fuppofed or to be inferred in a theorem, we muft find, according to the preceding obfervations, the connection between thefe pofitions and fuch relations of magnitude as can be expreffed and reafoned upon by algebra. The algebraical demonftrations of the 12th and 13th propofitions of the 2d book of Euclid, require only the 47th of the I. El. The 35th and 36th of the 3d book require only the 3. III. El. and 47. I. El.

From a few fimple geometrical principles alone, a number of conclufions, with regard to figures, may be deduced by algebra; and to this in a great meafure is owing the extenfive ufe of this fcience in geometry. If other more remote geometrical principles are occafionally introduced, the algebraical calculations may be much abridged. The fame is to be obferved in the folution of problems; but fuch in general are lefs obvious, and more properly belong to the ftrict geometrical method.

III. *Of the Solution of Problems.*

Upon the fame principles are geometrical problems to be refolved. The problem is fuppofed to be conftructed, and proper algebraical notations of the known and unknown magnitudes are to be fought for, by means of which their connections may be expreffed by equations. It may firft be remarked, as was done in the cafe of theorems, that in thofe problems which relate to the divifions of a line and the proportions of its parts, the expreffion of the quantities, and the ftating their relations by equations, are fo eafy as not to require any particular directions. But when various pofitions of geometrical figures and their properties are introduced, the folution requires more attention and fkill. No general rules can be given on this fubject, but the following obfervations may be of ufe.

1. The conftruction of the problem being fuppofed, it is often farther neceffary to produce fome of the lines till they meet; to draw new lines joining remarkable points; to draw lines from fuch points perpendicular or parallel to other lines, and fuch other operations as feem conducive to the finding of equations; and for this purpofe, thofe efpecially are to be employed which divide the fcheme into triangles that are given, right angled or fimilar.

2. It is often convenient to denote by letters, not the quantities particularly fought, but fome others from which they can eafily be deduced. The fame may be obferved of given quantities.

3. The proper notation being made, the neceffary equations are to be derived by the ufe of the moft fimple geometrical principles; fuch as the addition and fubftraction of lines or of fquares, the proportionality of lines, particularly of the fides of fimilar triangles, &c.

4. There muft be as many independent equations as there are unknown quantities affumed in the inveftigation, and from thefe a final equation may be inferred by the rules of Part I.

If the final equation from the problem be refolved, the roots may often be exhibited geometrically; but the geometrical conftruction of problems may be ef-

 fected

n If any known line is affumed as 1, as its powers do not appear, the terms of an equation, including any of them, may be of very different dimenfions; and before it can be properly expreffed by geometrical magnitudes, the deficient dimenfions muft be fupplied by powers of the 1. When an equation has been derived from geometrical relations, the line denoting 1 is known; and when an affumed equation is to be expreffed by the relations of geometrical magnitudes, the 1 is to be affumed.

In this manner may any fingle power be expreffed by a line. If it is x^5, then to 1, x find four quantities in continued proportion; fo that $1:x:m:n:p:q$, then $1:q::1^5:x^5$, or $q=x^5$; and fo of others.

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fected alfo without refolving the equation, and even without deducing a final equation, by the methods afterwards to be explained.

If the final equation is fimple or quadratic, the roots being obtained by the common rules, may be geometrically exhibited by the finding of proportionals, and the addition or fubtraction of fquares.

By inferting numbers for the known quantities, a numeral expreffion of the quantities fought will be obtained by refolving the equation. But in order to determine fome particulars of the problem befides finding the unknown quantities of the equation, it may be farther neceffary to make a fimple conftruction; or, if it is required that every thing be expreffed in numbers, to fubftitute a new calculation in place of that conftruction.

PROP. I. *To divide a given ftraight line* AB *into two parts, fo that the rectangle contained by the whole line and one of the parts may be equal to the fquare of the other part.*

This is prop. 11th II. B. of Eucl.

c A C B

Let C be the point of divifion, and let $AB=a$, $AC=x$, and then $CB=a-x$. From the problem $a^2-ax=x^2$; and this equation being refolved (Chap. V. P. II.) gives $x=\pm\sqrt{a^2+\frac{a^2}{4}}-\frac{a}{2}$

The quantity $\sqrt{a^2+\frac{a^2}{4}}$, is the hypothenufe of a right-angled triangle, of which the two fides are a and $\frac{a}{2}$, and is therefore eafily found; $\frac{a}{2}$ being taken from this line, gives $x=AC$, which is the proper folution. But if a line AC be taken on the oppofite fide of A, and equal to the above-mentioned hypothenufe, together with $\frac{a}{2}$, it will reprefent the negative root $-\sqrt{a^2+\frac{a^2}{4}}-\frac{a}{2}$, and will give another folution; for in this cafe alfo $AB\times Bc=Ac^2$. But c is without the line AB; and therefore, if it is not confidered as making a divifion of AB, this negative root is rejected.

This folution coincides with what is given by Euclid. For $\sqrt{a^2+\frac{a^2}{4}}$ is equal (fee the fig. of Prop. 11th II. B. Eucl. Simfon's edit.) to EB or EF, and therefore $x=\sqrt{a^2+\frac{a^2}{4}}-\frac{a}{2}=EF-EA=AF=AH$; and the point H correfponds to C in the preceding figure.

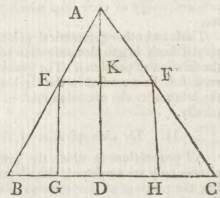
Befides, if on $(EF+EA=)$ CF (inftead of $EF-EA=FA$) a fquare be defcribed on the oppofite fide of CF from AG, BA produced will meet a fide of it in a point; which if it be called K, will give $KB\times BA=KA^2$. K correfponds to c, and this folution will correfpond with the algebraical folution by means of the negative root.

If CB had been called x, and $AC=a-x$, the equation would be $ax=a^2-2ax+x^2$, which gives $x=\frac{3a\pm\sqrt{5a^2}}{2}$, in which both roots are pofitive, and the folutions derived from them coincide with the preceding. If the folution be confined to a point within the line, then one of thefe pofitive roots muft be rejected, for one of the roots of the compound fquare from which it is derived, $x-\frac{3a}{2}$, a negative quantity, which in this ftrict hypothefis is not admitted. In fuch a problem, however, both conftructions are generally received, and confidered even as neceffary to a complete folution of it.

If a folution in numbers be required, let $AB=10$, then $x=\pm\sqrt{125}-5$. It is plain, whatever be the value of AB, the roots of this equation are incommenfurate, though they may be found, by approximation, to any degree of exactnefs required. In this cafe, $x=\pm 11.1803-5$, nearly; that is $AC=6.1803$, nearly; and $Ac=16.1803$, nearly.

PROB. II. *In a given Triangle* ABC *to infcribe a Square.*

Suppofe it to be done, and let it be EFHG. From A let AD be perpendicular on the bafe BC, meeting EF in K.

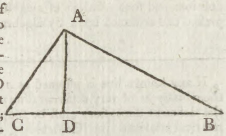


Let $BC=a$, and $AD=p$, both of which are given becaufe the triangle is given. Let AK be affumed as the unknown quantity, becaufe from it the fquare can eafily be conftructed; and let it be called x. Then $(KD=EG=)$ $EF=p-x$.

On account of the parallels EF, BC, $AD:BC::AK:EF$; that is, $p:a::x:p-x$, and $p^2-px=ax$, which equation being refolved, gives $x=\frac{p^2}{p+a}$.

Therefore x or AK is a third proportional to $p+a$ and p, and may be found by 11. VI. El. The point K being found, the conftruction of the fquare is fufficiently obvious.

PROB. III. *In the right-angled Triangle* ABC, *the Bafe* BC, *and the Sum of the Perpendicular and Sides* $BA+AC+AD$ *being given, to find the Triangle.*



Such parts of this triangle are to be found as are neceffary for defcribing it: The perpendicular AD will be fufficient for this purpofe; and let it be called x: Let $AB+AC+AD=a$, $BC=b$; therefore $BA+AC=a-x$.

Let

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Let BA—AC be denoted by y, then $BA=\frac{a+y-x}{2}$, and $AC=\frac{a-x-y}{2}$. But [47. I. El.] $BC^2=BA^2+AC^2$, which being expressed algebraically, becomes $b^2=\overline{\frac{a+y-x}{2}}^2+\overline{\frac{a-x-y}{2}}^2=\frac{a^2-2ax+x^2+y^2}{2}$. Likewise, from a known property of right-angled triangles, BC×AD=BA×AC; that is, $bx=\left(\frac{a+y-x}{2}\times\frac{a-y-x}{2}=\right)\frac{a^2-2ax+x^2-y^2}{4}$. This last equation being multiplied by 2, and added to the former, gives $b^2+2bx=a^2-2ax+x^2$, which being resolved according to the rules of Part I. Chap. V. gives $x=a+b-\sqrt{2ab+2b^2}$

To construct this: $a+b$ is the sum of the perimeter and perpendicular, and is given; $\sqrt{2ab+2b^2}=\sqrt{\overline{a+b}\times 2b}$ is a mean proportional between $a+b$ and $2b$, and may be found; therefore, from the sum of the perimeter and perpendicular subtract the mean proportional between the said sum and double the base, and the remainder will be the perpendicular required.

From the base and perpendicular the right-angled triangle is easily constructed.

In numbers, let $BA+AC+AD=18.8=a$; $BC=10=b$; then $AD=a+b-\sqrt{2ab+b^2}=28.8-\sqrt{576}=4.8=x$, and $BA+AC=14$. By either of the first equations $y^2=2b^2+2ax-a^2-x^2=4$ and $y=BA-AC=2$; therefore $BA=8$, and $AC=6$.

The geometrical expression of the roots of final equations arising from problems may be found without resolving them by the intersection of geometrical lines. Thus, the roots of a quadratic are found by the intersections of the circle and straight line, those of a cubic and biquadratic, by the intersections of two conic sections, &c.

The solution of problems may be effected also by the intersections of the *loci* of two intermediate equations without deducing a final equation. But these two last methods can only be understood by the doctrine of the *loci* of equations.

CHAP. II.

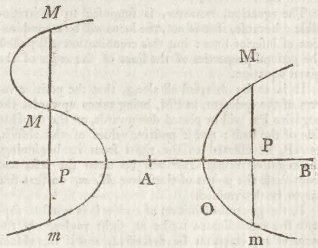
Of the Definition of Lines by Equations.

LINES which can be mathematically treated of must be produced according to an uniform rule, which determines the position of every point of them.

This rule constitutes the *definition* of any line from which all its other properties are to be derived.

A straight line has been considered as so simple as to be incapable of definition. The curve lines here treated of are supposed to be in a plane; and are defined either from the section of a solid by a plane, or more universally by some continued motion in a plane, according to particular rules. Any of the properties which are shown to belong peculiarly to such a line, may be assumed also as the definition of it, from which all the others, and even what upon other occasions may have been considered as the primary definition, may be demonstrated. Hence lines may be defined in various methods, of which the most convenient is to be determined by the purpose in view. The simplicity of a definition, and the ease with which the other properties can be derived from it, generally give a preference.

Definitions. 1. When curve lines are defined by equations, they are supposed to be produced by the extremity of one straight line, as PM moving in a given angle along another straight line AB given in position, which is called the base.



2. The straight line PM moving along the other, is called an *Ordinate*, and is usually denoted by y.

3. The segment of the base AP between a given point in it A, and an ordinate PM, is called an *Abscifs* with respect to that ordinate, and is denoted by x. The ordinate and abcifs together are called *Co-ordinates*.

4. If the relation of the variable abscifs and ordinate AP and PM, be expressed by an equation, which besides x and y contains only known quantities, the curve MO described by the extremity of the ordinate, moving along the base, is called the *Locus* of that equation.

5. If the equation is finite, the curve is called *Algebraical* (A). It is this class only which is here considered.

6. The *dimensions* of such equations are estimated from the highest sum of the exponents of x and y in any term.—According to this definition, the terms x^4, x^3y, x^2y^2, xy^3, y^4 are all of the same dimension.

7. Curve lines are divided into *orders* from the dimensions of their equations, when freed from fractions and surds.

In these general definitions, the straight line is supposed to be comprehended, as it is the locus of simple equations. The loci of quadratic equations are shown to

(A) The terms *Geometrical* and *Algebraical*, as applied to curve lines, are used in different senses, by different writers; there are several other classes of curves besides what is here called algebraical, which can be treated of mathematically, and even by means of algebra. See Scholium at the end.

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to be the conic fections, which are hence called lines of the fecond order, &c.

It is fufficiently plain from the nature of an equation, containing two variable quantities, that it muft determine the pofition of every point of the curve, defined by it in the manner now defcribed: for if any particular known value of one of the variable quantities as x be affumed, the equation will then have one unknown quantity only, and being refolved, will give a precife number of correfponding values of y, which determine fo many points of the curve.

As every point of the locus of an equation has the fame general property, it muft be one curve only, and from this equation all its properties may be derived. It is plain alfo, that any curve line defined from the motion of a point, according to a fixed rule, muft either return into itfelf, or be extended *ad infinitum* with a continued curvature.

The equation, however, is fuppofed to be irreducible; becaufe, if it is not, the locus will be a combination of inferior lines: but this combination will poffefs the general properties of the lines of the order of the given equation.

It is to be obferved all along, that the pofitive values of the ordinate, as PM, being taken upwards, the negative Pm will be placed downwards, on the oppofite fide of the bafe: and if pofitive values of the abfcifs, as AP, be affumed to the right from its beginning, the negative values, A*P* will be upon the left, and from thefe the points of the curve *M*, *m*, on that fide are to be determined.

In the general definition of curves it is ufual to fuppofe the co-ordinates to be at right angles. If the locus of any equation be defcribed, and if the abfcifs be affumed on another bafe, and the ordinate be placed at a different angle, the new equation expreffing their relation, though of a different form, will be of the fame order as the original equation; and likewife will have, in common with it, thofe properties which diftinguifh the equations of that particular curve.

This method of defining curves by equations may not be the fitteft for a full inveftigation of the properties of a particular curve; but as their number is without limit, fuch a minute inquiry concerning all, would be not only ufelefs, but impoffible. It has this great advantage, however, that many of the general affections of all curves, and of the diftinct orders, and alfo fome of the moft ufeful properties of particular curves, may be eafily derived from it.

I. *The Determination of the Figure of a Curve from its Equation.*

The general figure of the curve may be found by fubftituting fucceffively particular values of x the abfcifs, and finding by the refolution of thefe equations the correfponding values of y the ordinate, and of confequence fo many points of the curve. If numeral values be fubftituted for x, and alfo certain numbers for the known letters, the refolution of the equation gives numeral expreffions of the ordinates; and from thefe, by means of fcales, a mechanical defcription of the curve will be obtained, which may often be ufeful, both in pointing out the general difpofition of the figure, and alfo in the practical applications of geometry.

Some more general fuppofitions may be of ufe in determining the figure; but thefe can be fuggefted only from the particular form of the equation in view. By fuppofing x to have certain relations to the known quantities, the values of y may become more fimple, and the equation may be reduced to fuch a form as to fhow the direction of the curve, and fome of its obvious properties.

The following general obfervations may alfo be laid down:

1. If in any cafe a value of y vanifhes, then the curve meets the bafe in a point determined by the correfponding value of x. Hence by putting $y=0$, the roots of the equation, which in that fituation are values of x, will give the diftances on the bafe from the point affumed as the beginning of x, at which the curve meets it.

2. If at a particular value of x, y becomes infinite, the curve has an infinite arc, and the ordinate at that point becomes an afymptote.

3. If when x becomes infinitely great, y vanifhes, the bafe becomes an afymptote.

4. If any value of y becomes impoffible, then fo many interfections of the ordinate and curve vanifh. If at any value of x all the values of y become impoffible, the ordinate does not there meet the curve.

5. If two values of y become equal and have the fame fign, the ordinate in that fituation either touches the curve, or paffes through an interfection of two of its branches, which is called a *punctum duplex*, or through an oval become infinitely little, called a *punctum conjugatum*.

In like manner is a *punctum triplex*, &c. to be determined.

The following example will illuftrate this doctrine:

Let the equation be $ay^2-xy^2=x^3+bx^2$:

Therefore, $y^2=\frac{x^3+bx^2}{a-x}$ and $y=\pm\sqrt{\frac{x^3+bx^2}{a-x}}$ $=\pm\sqrt{\frac{x+b}{a-x}}\times x$.

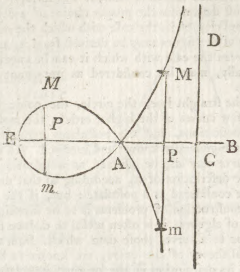
Let AB be affumed as a bafe on which the abfciffes are to be taken from A, and the ordinates perpendicular to it.

Since the two values of y are equal, but have oppofite figns; PM, and Pm which reprefent them, muft be taken equal to each other on oppofite fides of AB; and it is plain that the parts of the curve on the two fides of AB, muft be every way fimilar and equal.

If x is made equal to a, then $y=x\sqrt{\frac{x+b}{0}}$ which is an algebraical expreffion for infinity; therefore if AC is taken equal to a, the perpendicular CD will become an affymptote to the curve, which will have two infinite arcs (Obf. 2.). If x is greater than a, the quantity under the radical fign becomes negative, and the values of y are impoffible; that is, no part of the curve lies beyond CD. (4.)

Both branches of the curve pafs through A, fince $y=0$, when $x=0$. (1.) Let x be negative, and $y=\pm x\sqrt{\frac{b-x}{a+x}}$; the values of y will be poffible, if x is not greater than b; but if $x=b$, then $y=0$, and if x is greater

er than b, the values of y become impossible; that is, if the absciss AP be taken to the left of A, and less than b, there will be two real equal values of y, viz. PM, Pm on the opposite sides as before; if AE be taken equal to b the curve will pass through E, and no part of it is beyond E. (1. and 4.)



The portion between A and E is called a *Nodus*.

If y be put $=0$, then the values of x are 0, 0, $-b$. That is, the curve passes twice through A, or A is a punctum duplex, and it passes also through E as before. (1.)

The mechanical description of curves mentioned in the beginning of this section, may be illustrated by the preceding example. For this purpose, let any numeral values of a and b be assumed; and if successive numeral values of x be inserted, corresponding numeral values of y will be obtained, by which so many points in the curve may be constructed.

Let $AC=a=10$; $AE=b=12$; and, first let $x=1$, then $y=\pm x\sqrt{\dfrac{x+b}{a-x}}=\pm\dfrac{\sqrt{13}}{3}=\pm 1.2$ nearly, which gives the length of the ordinates when the abscis is 1; and in the same manner are the ordinates to be found when x is 2, 3, or any other number. Thus, if $x=6$, then $y=\pm 6\times\dfrac{\sqrt{18}}{2}=12.73$ nearly; and if AP be taken from the scale of equal parts (according to which AB and AE are supposed to be laid down) and equal to 6, then PM, Pm, being taken from the same scale, each equal to 12.73, will give the points of the curve M, m. In like manner, if $x=-y$, $y=\pm 9\sqrt{\dfrac{3}{19}}=\pm$ 3.58, nearly; and if $AP=9$, then PM, Pm being taken from the same scale equal to 3.58, will give the points M, m. In the same manner may any number of points be found, and these being joined, will give a representation of the curve, which will be more or less just, according to the number of points found, and the accuracy of the several operations employed.

By the same methods the locus of any other equation is to be traced: Thus, by varying the former equation, the figure of its locus will be varied. If $b=0$, then the points A and E coincide, the nodus vanishes, and A is called a *cuspis*.

If b is negative, then E is to the right of A, which will now be a punctum conjugatum. The rest of the curve will be between E and C, and CD becomes an assymptote.

If $a=0$ then $-xy^2=x^3-bx^2$ or $y^2=bx-x^2$, which is an equation to the circle of which $b=AE$ is the diameter.

II. *General Properties of Curves from their Equations.*

The general properties of equations lead to the general affections of curve lines. For example,

A straight line may meet a curve in as many points as there are units in the dimension of its equation; for so many roots may that equation have. An asymptote may cut a curve line in as many points, excepting two, as it has dimensions, and no more. The same may be observed of the tangent.

Impossible roots enter an equation by pairs; therefore the intersections of the ordinate and curve must vanish by pairs.

The curves of which the number expressing the order is odd, must have at least two infinite arcs; for the abscis may be so assumed, that, for every value of it, either positive or negative, there must be at least one value of y, &c.

The properties of the coefficients of the terms of equations, mentioned Part II. Chap. I. furnish a great number of the curious and universal properties of curve lines. For example, the second term of an equation is the sum of the roots with the signs changed, and if the second term is wanting, the positive and negative roots must be equal. From this it is easy to demonstrate, "That if each of two parallel straight lines meet a curve line in as many points as it has dimensions, and if a straight line cut these two parallels, so that the sum of the segments of each on one side be equal to the sum of the segments on the other, this straight line will cut any other line parallel to these in the same manner." Analogous properties, with many other consequences from them, may be deduced from the composition of the coefficients of the other terms.

Many properties of a particular order of curves may be inferred from the properties of equations of that order. Thus, "If a straight line cut a curve of the third order in three points, and if another straight line be drawn, making a given angle with the former, and cutting the curve also in three points, the parallelopiped by the segments of one of these lines between its intersection with the other, and the points where it meets the curve, will be to the parallelopiped by the like segments of the other line in a given ratio." This depends upon the composition of the absolute term, and may be extended to curves of any order.

III. *The Subdivision of Curves.*

As lines are divided into orders from the dimensions of their equations, in like manner, from the varieties of the equations of any order, may different *genera* and *species* of that order be distinguished, and from the peculiar properties of these varieties, may the affections of the particular curves be discovered.

For this purpose a complete general equation is assumed of that order, and all the varieties in the terms and coefficients which can affect the figure of the locus are enumerated.

It

It was formerly obferved, that the equations belonging to any one curve, may be of various forms, according to the pofition of the bafe, and the angle which the ordinate makes with it, though they be all of the fame order, and have alfo certain properties, which diftinguifh them from the other equations of that order.

The locus of fimple equations is a *ftraight line*. There are *three* fpecies of lines of the fecond order, which are eafily fhown to be the *conic fections*, reckoning the circle and ellipfe to be one. *Seventy-eight* fpecies have been numbered of the third order: And as the fuperior orders become too numerous to be particularly reckoned, it is ufual only to divide them into certain general claffes.

A complete arrangement of the curves of any order would furnifh canons, by which the fpecies of a curve whofe equation is of that order might be found.

IV. *Of the place of Curves defined from other principles in the Algebraical Syftem.*

If a curve line be defined from the fection of a folid, or from any rule different from what has been here fuppofed, an equation to it may be derived, by which its order and fpecies in the algebraical fyftem may be found. And, for this purpofe, any bafe and any angle of the co-ordinates may be affumed, from which the equation may be moft eafily derived, or may be of the moft fimple form.

The three *Conic Sections* are of the fecond order, as their equations are univerfally quadratic; the *Ciffoid* of the ancients is of the third order, and the 42 fpecies, according to Sir Ifaac Newton's enumeration; this is the curve defined by the equation in page 439, col. 1. par. ult. when $b=0$. The curve delineated above in the fame page, is the 41ft fpecies. When b is negative in that equation, the locus is the 43d fpecies. The *Conchoid* of Nicomedes is of the fourth order; the *Caffinian* curve is alfo of the fourth order, &c.

It is to be obferved, that not only the firft definition of a curve may be expreffed by an equation, but likewife any of thofe theorems called *loci*, in which fome property is demonftrated to belong to every point of the curve. The expreffion of thefe propofitions by equations, is fometimes difficult; no general rules can be given; and it muft be left to the fkill and experience of the learner.

Scholium.

This method of treating curve lines by equations, befides the ufes already hinted at, has many others, which do not belong to this place; fuch are, the finding the tangents of curves, their curvature, their areas and lengths, &c. The folution of thefe problems has been accomplifhed by means of the equations to curves, though by employing, concerning them, a method of reafoning different from what has been here explained.

CHAP. III.

I. *Conftruction of the Loci of Equations.*

The defcription of a curve, according to the definition of it, is affumed in geometry as a *poftulate*.

If the properties of a particular curve are inveftigated, it will appear that it may be defcribed from a variety of data different from thofe affumed in the poftulate, by demonftrating the dependence of the former upon the latter.

As the definitions of a curve may be various, fo alfo may be the poftulates, and a definition is frequently chofen from the mode of defcription connected with it. The particular object in view, it was formerly remarked, muft determine the proper choice of a definition; the fimplicity of it, the eafe with which the other properties of the figure may be derived from it, and fometimes even the eafe with which it can be executed mechanically, may be confidered as important circumftances.

In the ftraight line, the circle, the conic fections, and a few curves of the higher orders, the moft convenient definitions, and the poftulates connected with them, are generally known and received. An equation to a curve may alfo be affumed as a definition of it; and the defcription of it, according to that definition, may be confidered as a poftulate: but, if the geometrical conftruction of problems is to be inveftigated by means of algebra, it is often ufeful to deduce from the equation to a curve, thofe data which, from the geometrical theory of the curve, are known to be neceffary to its defcription in the original poftulate, or in any problem founded upon it. This is called *Conftructing the locus* of an equation, and from this method are generally derived the moft elegant conftructions which can be obtained by the ufe of algebra. In the following fection, there is an example of a problem refolved by fuch conftructions.

Sometimes a mechanical defcription of a curve line defined by an equation is ufeful; and as the exhibition of it, by fuch a motion as is fuppofed in that definition, is rarely practicable, it generally becomes neceffary to contrive fome more fimple motion which may in effect correfpond with the other, and may defcribe the curve with the degree of accuracy which is wanted. Frequently, indeed, the only method which can be conveniently practifed, is the finding a number of points in the curve by the refolution of numeral equations, in the manner mentioned in Sect. 1. of this Chapter, and then joining thefe points by the hand; and though this operation is manifeftly imperfect, it is on fome occafions ufeful.

II. *Solution of Problems.*

The folution of geometrical problems by algebra is much promoted, by defcribing the loci of the equations arifing from thefe problems.

For this purpofe, equations are to be derived, according to the methods formerly defcribed, and then to be reduced to two, containing each the fame two unknown quantities. The loci of thefe equations are to be defcribed, the two unknown quantities being confidered as the co-ordinates, and placed at the fame angle in both. The co-ordinates at an interfection of the loci, will be common to both, and give a folution of the problem.

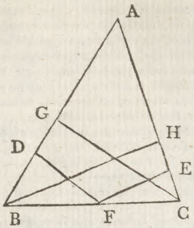
The fimplicity of a conftruction obtained by this method, will depend upon a proper notation, and the choice of the equations of which the loci are to be defcribed. Thefe will frequently be different from what would be proper in a different method of folution.

Prob.

Application to Geometry.

Prob. IV. *To find a Point F in the Base of the given Triangle ABC, so that the Sum of the Squares of FE, FD drawn from it perpendicular upon the two Sides, may be equal to a given Space.*

Draw BH, CG perpendicular on the two sides, and let $FD=x$, $FE=y$, $BF=z$, $BC=b$, $BH=p$, $CG=r$, and the given space $FD^2+FE^2=m^2$.

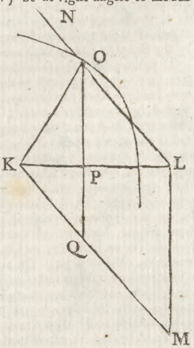


From similar triangles $z:x::b:r$ and $z=\frac{bx}{r}$.

Also $b-z:y::b:p$, and $z=b-\frac{yb}{p}$; therefore $\frac{bx}{r}=b-\frac{yb}{p}$. That is $y=p-\frac{px}{r}$, an equation to a straight line.

But $x^2+y^2=m^2$ of which the locus is a circle, having m for the radius. By constructing these loci, their intersection will give a solution of the problem.

Let $KL=CG$ $(=r)$ be at right angles to $LM=BH$ $(=p)$, join KM to which let LN be parallel; LN is the locus of the equation $y=p-\frac{px}{r}$; for let any line OPQ be drawn parallel to LM, if $KP=x$, then $PQ=\frac{px}{r}$, and $QO=LM=p$, therefore $PO=y=p-\frac{px}{r}$.



About the centre K, with a distance equal to the line m, let a circle be described; that circle will be the locus of the equation $m^2=x^2+y^2$; for it is plain that if OP be any perpendicular from the circumference upon KL, KP being x, OP will be y. Either of the points, therefore, in which these two loci intersect each other, as O, will give OP an ordinate in both equations, KP being the common absciss; therefore KP, OP are the two perpendiculars required, from which the point F is easily found.

The construction might have been made on figure 1st, with fewer lines. If the circle touches LN, there is only one solution which is a minimum; and if the circle does not meet LN, the problem becomes impossible.

When the circle touches LN, the radius m must be equal to the perpendicular from K on LN, or from L on KM. This perpendicular is equal to $\frac{pr}{\sqrt{p^2+r^2}}$ or a fourth proportional to MK, KL, and LM, and its square therefore is the least sum of the squares of the perpendiculars from a point in the base on the two sides.

It may be remarked also, that the point which gives the sum of the squares a minimum, is found by dividing the base, in the proportion of the squares of the two sides of the triangle; and this is easily demonstrated from the preceding construction.

Prob. V. *Between two given Lines to find two mean Proportionals.*

Let the lines be a and b, and let the two means be x and y; therefore $a:x:y:b$, and hence $ay=x^2$, and $bx=y^2$, which are both equations to the parabola, and are easily constructed. The co-ordinates at the intersection of these two loci will be the means required.

If one unknown quantity only is assumed, or if it is convenient to deduce a final equation containing only one, the construction of the roots is to be obtained by the method mentioned in the next section.

Scholium.

The constructions of the two preceding problems are geometrical; but it is sometimes convenient to have a practical solution, by the mechanical description either of the algebraical lines employed in the geometrical solution, or of other geometrical lines by which it can be effected. But few of these are tolerably accurate; so that, in general, by means of calculation, the practical operations are all reduced to what may be performed by a ruler and a compass.

III. *Construction of Equations.*

The roots of an equation, containing only one unknown quantity, may be found by the intersection of lines, the product of whose dimensions is equal to the dimension of that equation. And hence problems are resolved without an algebraical solution of the equation arising from them.

Thus cubic and biquadratic equations may be constructed by the intersections of two conic sections as the circle and parabola, which are generally assumed as being most easily described.

In order to find these constructions, a new equation is to be assumed, containing two variable quantities, one of which is the unknown quantity of the given equation, and the other by substitution is to be inserted also in the given equation; the intersection of the loci of these equations will exhibit the roots required.

Canons may be devised for the construction of particular orders, without assuming the new equation.

The final equation from prob. 5. would be $x^3=a^2b$, which being constructed according to the rules, exhibits the common geometrical solution of that problem by the circle and parabola.

If an equation be assumed, as $ay=x^2$, the other by substitution becomes $xy=ab$; the locus of the former is a parabola, and of the latter an hyperbola, one of its assymptotes being the base, and the co-ordinates at their intersection will represent x and y; the first of the two means is x, and in this case y is the other.

Equa-

Application to Geometry.

Equations alſo might be aſſumed ſo as to give a ſolution of this problem by other combinations of two of the conic ſections, one of them not being the circle.

As geometrical magnitudes may be repreſented by algebra, ſo algebraical quantities and numbers may be repreſented by lines. Hence this conſtruction of equations has ſometimes been uſed as an eaſy method of approximation to the roots of numeral equations. For this purpoſe, the neceſſary ſtraight lines muſt be laid down by means of a ſcale of equal parts, and the curve lines, on whoſe interſection the conſtruction depends, muſt be actually deſcribed; the linear roots being meaſured on the ſcale will give the numbers required. Theſe operations may be performed with ſufficient accuracy for certain purpoſes; but as they depend on mechanical principles, the approximation obtained by them cannot be continued at pleaſure; and hence it is ſeldom uſed, except in finding the firſt ſtep of an approximation, which is to be carried on by other methods.

Scholium.

If the relation between the ordinate and abſciſs be fixed, but not expreſſible by a finite equation, the curve is called *Mechanical* (A) or *Tranſcendental*. This claſs is alſo ſometimes defined by equations, by ſuppoſing either x or y in a finite equation to be a curve line, of which the relation to a ſtraight line cannot be expreſſed in finite terms.

If the variable quantities x or y enter the exponents of any term of an equation, the locus of that equation is called an *Exponential Curve*.

Many properties of theſe two claſſes of curves may be diſcovered from their equations.

Algedo || Algiabarii.

ALGEDO, the running of a gonorrhœa ſtopping ſuddenly after it appears. When it thus ſtops, a pain reaches to the anus, or to the teſticles, without their being ſwelled; and ſometimes this pain reaches to the bladder; in which caſe there is an urging to diſcharge the urine, which is with difficulty paſſed, and in very ſmall quantities at a time. The pain is continued to the bladder by the urethra; to the anus, by the acceleratory muſcles of the penis; and to the teſticles, by the vaſa deferentia, and veſiculæ ſeminales. In this caſe, calomel repeated ſo as to purge, brings back the running, and then all difficulty from this ſymptom ceaſes.

ALGENEB, a fixed ſtar, of the ſecond magnitude, in Perſeus's right ſide; its longitude is 27° 46′ 12″ of Taurus, and its latitude 30° 05′ 28″ north, according to Mr Flamſtead's catalogue.

ALGEZIRA, a town of Andaluſia in Spain, with a port on the coaſt of the Straits of Gibraltar. By this city the Moors entered Spain in 713; and it was taken from them in 1344, after a very long ſiege, remarkable for being the firſt in which cannon were made uſe of. It was called *Old Gibraltar*, and is about four leagues from the New. W. Long. 5. 2. N. Lat. 36. 0.

ALGHIER, or ALGERI, a town in Sardinia, with a biſhop's ſee, upon the weſtern coaſt of the iſland, between Saſſeri and Boſa. Though it is not large, it is well peopled, and has a commodious port. The coral fiſhed for on this coaſt is in the higheſt eſteem of any in the Mediterranean. W. Long. 4. 2. Lat. 36. 0.

ALGIABARII, a Mahometan ſect of predeſtinarians, who attribute all the actions of men, good or evil, to the agency or influence of God. The Algiabarii ſtand oppoſed to the ALKADARII. They hold abſolute degrees and phyſical premotion. For the juſtice of God in puniſhing the evil he has cauſed, they reſolve it wholly into his abſolute dominion over the creatures.

A L G

Algiers.

ALGIERS, a kingdom of Africa, now one of the ſtates of Barbary.—According to the lateſt and beſt computations, it extends 460 miles in length from eaſt to weſt, and is very unequal in breadth; ſome places being ſcarce 40 miles broad, and others upwards of 100. It lies between Long. 0. 16. and 9. 16. W. and extends from Lat. 36. 55. to 44. 50. N.—It is bounded on the north, by the Mediterranean; on the eaſt, by the river Zaine, the ancient Tuſca, which divides it from Tunis; on the weſt, by the Mulvya, and the mountains of Trava, which ſeparate it from Morocco; and on the ſouth by the Sahara, Zaara, or Numidian deſert.

1 Climate and ſoil.

The climate of Algiers is in moſt places ſo moderate, that they enjoy a conſtant verdure; the leaves of the trees being neither parched up by heat in ſummer, nor nipped by the winter's cold. They begin to bud in February; in April the fruit appears in its full bigneſs, and is commonly ripe in May. The ſoil, however, is exceſſively various; ſome places being very hot, dry, and barren, on which account they are generally ſuffered to lie uncultivated by the inhabitants, who are very negligent. Theſe barren places, eſpecially ſuch as lie on the ſouthern ſide, and are at a great diſtance from the ſea, harbour vaſt numbers of wild creatures, as lions, tigers, buffaloes, wild boars, ſtags, porcupines, monkeys, oſtriches, &c. On account of their barrenneſs, they have but few towns, and thoſe thinly peopled; though ſome of them are ſo advantageouſly ſituated for trading with Bildulgerid and Negroland, as to drive a conſiderable traffic with them.

The Algerine kingdom made formerly a conſiderable part of the Mauritania Tingitana (See MAURITANIA), which was reduced to a Roman province by Julius Cæſar, and from him alſo called *Mauritania Cæſarienſis*.—In the general account of Africa, it has been noticed, that the Romans were driven out of that continent by the Vandals; theſe by Beliſarius, the Greek emperor Juſtinian's general; and the Greeks in their turn by the Saracens. This laſt revolution happened

(A) The term *Mechanical*, in this place, is uſed merely as the name of a particular claſs of curves, without implying that they have any more dependence on the principles of Mechanics or Phyſics than the algebraical curves which have been treated of.

happened about the middle of the ſeventh century; and the Arabs continued maſters of the country, divided into a great number of petty kingdoms or ſtates, under chiefs of their own chooſing, till the year 1051.

2 Abu-Texefien ſubdues the Arab princes.

This year, one Abubeker-ben-Omar, or, as the Spaniſh authors call him, *Abu-Texefien*, an Arab of the Zinhagian tribe, being provoked at the tyranny of thoſe deſpots, gathered, by the help of his marabouts or ſaints, a moſt powerful army of malcontents, in the ſouthern provinces of Numidia and Libya. His followers were nicknamed *Marabites* or *Morabites;* by the Spaniards, *Almoravides;* probably from their being aſſembled principally by the ſaints who were alſo called *Morabites.* The khalif of Kayem's forces were at this time taken up with quelling other revolts in Syria, Meſopotamia, &c. and the Arabs in Spain engaged in the moſt bloody wars; ſo that Texefien having nothing to fear from them, had all the ſucceſs he could wiſh againſt the Arabian cheyks or petty tyrants, whom he defeated in many battles, and at laſt drove them not only out of Numidia and Libya, but out of all the weſtern parts, reducing the whole province of Tingitania under his dominion.

Texefien was ſucceeded by his ſon Yuſef, or Joſeph, a brave and warlike prince. In the beginning of his reign, he laid the foundation of the city of Morocco, which he deſigned to make the capital of his empire. While that city was building, he ſent ſome of his marabouts ambaſſadors to Tremecen (now a province of Algiers), at that time inhabited by a powerful and inſolent ſect of Mahometans called *Zeneti.* The deſign of this embaſſy was to bring them back to what he called the *true faith;* but the Zeneti, deſpiſing his offers, aſſembled at Amaf, or Amſa, their capital, murdered the ambaſſadors, and invaded Joſeph's dominions with an army of 50,000 men.

3 Zeneti deſtroyed.

The king hearing of their infamous proceedings, ſpeedily muſtered his army, and led it by long marches into their country, deſtroying all with fire and ſword; while the Zeneti, inſtead of oppoſing his progreſs, retired as faſt as poſſible towards Fez, in hopes of receiving aſſiſtance from thence. In this they were miſerably deceived: the Fezzans marched out againſt them in a hoſtile manner; and coming up with the unhappy Zeneti, encumbered with their families and baggage, and ready to expire with hunger and wearineſs, they cut them all to pieces, except a ſmall number who were moſtly drowned in attempting to ſwim acroſs a river, and ſome others who in their flight periſhed by falling from the high adjacent rocks. In the mean time Joſeph reduced their country to a mere deſart: which was, however, ſoon peopled by a numerous colony of Fezzans, who ſettled there under the protection of the reigning kings. In this war it is computed that near a million of the Zeneti, men, women, and children, loſt their lives.

The reſtleſs and ambitious temper of Joſeph did not let him remain long at peace. He quickly declared war againſt the Fezzans, reduced them to become his tributaries, and extended his conqueſts all along the Mediterranean. He next attacked ſome Arabian cheyks who had not yet ſubmitted to his juriſdiction; and purſued them with ſuch fury, that neither the Libyan deſarts, nor ridges of the moſt craggy rocks, could ſhelter them from his arms. He attacked them in ſuch of their retreats, caſtles, and fortreſſes, as were till then deemed impregnable; and at laſt ſubdued them, to the great grief of the other African nations, who were greatly annoyed by the ravages committed by his numerous forces.

Thus was founded the empire of the Morabites: which, however, was of no long duration; that race being in the 12th century driven out by Mohavedin, a marabout. This race of prieſts was expelled by Abdulac governor of Fez; and he, in the 13th century, ſtripped of his new conqueſts by the Sharifs of *Haſcen,* the deſcendants of thoſe Arabian princes whom Abu-Texefien had formerly expelled.

4 Sharifs of Haſcen who.

The better to ſecure their new dominions, the Sharifs divided them into ſeveral little kingdoms or provinces; and among the reſt the preſent kingdom of Algiers was divided into four, namely, *Tremecen, Tenez, Algiers proper,* and *Bujeyah.* The four firſt monarchs laid ſo good a foundation for a laſting balance of power between their little kingdoms, that they continued for ſome centuries in mutual peace and amity; but at length the king of Tremecen having ventured to violate ſome of their articles, Abul-Farez, king of Tenez, declared war againſt him, and obliged him to become his tributary. This king dying ſoon after, and having divided his kingdom among his three ſons, new diſcords aroſe; which Spain taking advantage of, a powerful fleet and army was ſent againſt Barbary, under the Count of Navarre, in 1505. This commander ſoon made himſelf maſter of the important cities of Oran, Bujeyah, and ſome others; which ſo alarmed the Algerines, that they put themſelves under the protection of Selim Eutemi, a noble and warlike Arabian prince. He came to their aſſiſtance with a great number of his braveſt ſubjects, bringing with him his wife Zaphira, and a ſon then about 12 years old. This however was not ſufficient to prevent the Spaniards from landing a number of forces near Algiers that ſame year, and obliging that metropolis to become tributary to Spain. Nor could Prince Selim hinder them from building a ſtrong fort on a ſmall iſland oppoſite to the city, which terrified their corſairs from ſailing either in or out of the harbour.

5 Algerines in danger from the Spaniards.

To this galling yoke the Algerines were obliged to ſubmit till the year 1516; when, hearing of the death of Ferdinand king of Spain, they ſent an embaſſy to *Aruch Barbaroſſa,* who was at this time no leſs dreaded for his valour than his ſurpriſing ſucceſs, and was then ſent on a cruize with a ſquadron of galleys and barks. The purport of the embaſſy was, that he ſhould come and free them from the Spaniſh yoke; for which they agreed to pay him a gratuity anſwerable to ſo great a ſervice. Upon this Barbaroſſa immediately diſpatched 18 galleys and 30 barks to the aſſiſtance of the Algerines; while he himſelf advanced towards the city with 800 Turks, 3000 Jigelites, and 2000 Mooriſh volunteers. Inſtead of taking the neareſt road to Algiers, he directed his courſe towards *Sharſhel,* where *Haſſan,* another famed corſair, had ſettled himſelf. Him he ſurpriſed, and obliged to ſurrender; not without a previous promiſe of friendſhip: but no ſooner had Barbaroſſa got him in his power, than he cut off his head; and obliged all Haſſan's Turks to follow him in his new expedition.

6 Invite Barbaroſſa.

On Barbaroſſa's approach to Algiers, he was met by

prince

Algiers.

7
His treachery and cruelty.

prince Eutemi, attended by all the people of that metropolis, great and ſmall; who looked for deliverance from this abandoned villain, whom they accounted invincible. He was conducted into the city amidſt the acclamations of the people, and lodged in one of the nobleſt apartments of prince Eutemi's palace, where he was treated with the greateſt marks of diſtinction. Elated beyond meaſure with this kind reception, Barbaroſſa formed a deſign of becoming king of Algiers; and fearing ſome oppoſition from the inhabitants, on account of the exceſſes he ſuffered his ſoldiers to commit, murdered prince Eutemi, and cauſed himſelf to be proclaimed king; his Turks and Moors crying out as he rode along the ſtreets, "Long live King Aruch Barbaroſſa, the invincible king of Algiers, the *choſen of God* to deliver the people from the oppreſſion of the Chriſtians; and deſtruction to all that ſhall oppoſe, or refuſe to own him as their lawful ſovereign." Theſe laſt threatening words ſo intimidated the inhabitants, already apprehenſive of a general maſſacre, that he was immediately acknowledged king. The unhappy princeſs Zaphira, it is ſaid, poiſoned herſelf, to avoid the brutality of this new king, whom ſhe unſucceſsfully endeavoured to ſtab with a dagger.

Barbaroſſa was no ſooner ſeated on the throne, than he treated his ſubjects with ſuch cruelty, that they uſed to ſhut up their houſes and hide themſelves when he appeared in public. In conſequence of this, a plot was ſoon formed againſt him; but being diſcovered, he cauſed twenty of the principal conſpirators to be beheaded, their bodies to be buried in a dunghill, and laid a heavy fine on thoſe who ſurvived. This ſo terrified the Algerines, that they never afterwards durſt attempt any thing againſt either Barbaroſſa or his ſucceſſors.

In the mean time, the ſon of prince Eutemi having fled to Oran, and put himſelf under the protection of the marquis of Gomarez, laid before that nobleman a plan for putting the city of Algiers into the hands of the king of Spain. Upon this, young Selim Eutemi was ſent to Spain, to lay his plan before cardinal Ximenes; who having approved of it, ſent a fleet with 10,000 land forces, under the command of *Don Franciſco*, or, as others call him, *Don Diego de Vera*, to drive out the Turks, and reſtore the young prince. But the fleet was no ſooner come within ſight of land, than it was diſperſed by a ſtorm, and the greateſt part of the ſhips daſhed againſt the rocks. Moſt of the Spaniards were drowned; and the few who eſcaped to ſhore were either killed by the Turks or made ſlaves.

Though Barbaroſſa had nothing to boaſt on this occaſion, his pride and inſolence were now ſwelled to ſuch a degree, that he imagined himſelf invincible, and that the very elements conſpired to make him ſo. The Arabians were ſo much alarmed at his ſucceſs, that they implored the aſſiſtance of Hamidel Abdes king of Tenez, to drive the Turks out of Algiers. That prince readily undertook to do what was in his power for this purpoſe, provided they agreed to ſettle the kingdom on himſelf and his deſcendants. This propoſal being accepted, he immediately ſet out at the head of 10,000 Moors; and, upon his entering the Algerine dominions, was joined by all the Arabians in the country. Barbaroſſa engaged him, only with 1000 Turkiſh muſqueteers and 500 Granada Moors; totally defeated his numerous army; purſued him to the very gates of his capital, which he eaſily made himſelf maſter of; and, having given it up to be plundered by his Turks, obliged the inhabitants to acknowledge him as their ſovereign. This victory, however, was chiefly owing to the advantage which his troops had from their fire-arms; the enemy having no other weapons than arrows and javelins.

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No ſooner was Barbaroſſa become maſter of the kingdom of Tenez, than he received an embaſſy from the inhabitants of Tremecen; inviting him to come to their aſſiſtance againſt their then reigning prince, with whom they were diſſatisfied on account of his having dethroned his nephew, and forced him to fly to Oran; offering him even the ſovereignty, in caſe he accepted of their propoſal. The king of Tremecen, not ſuſpecting the treachery of his ſubjects, met the tyrant with an army of 6000 horſe and 3000 foot: but Barbaroſſa's artillery gave him ſuch an advantage, that the king was at length forced to retire into the capital; which he had no ſooner entered, than his head was cut off, and ſent to Barbaroſſa, with a freſh invitation to come and take poſſeſſion of the kingdom. On his approach, he was met by the inhabitants, whom he received with great complaiſance, and many fair promiſes; but beginning to tyrannize as uſual, his new ſubjects ſoon convinced him that they were not ſo paſſive as the inhabitants of Algiers. Apprehending, therefore, that his reign might prove uneaſy and precarious, he entered into an alliance with the king of Fez; after which, he took care to ſecure the reſt of the cities in his new kingdom, by garriſoning them with his own troops. Some of theſe, however, revolted ſoon after; upon which he ſent one of his corſairs, named *Eſcander*, a man no leſs cruel than himſelf, to reduce them. The Tremecenians now began to repent in good earneſt of their having invited ſuch a tyrant to their aſſiſtance; and held conſultations on the moſt proper means of driving him away, and bringing back their lawful prince *Abuchen Men*: but their cabals being diſcovered, a great number of the conſpirators were maſſacred in the moſt cruel manner. The prince had the good luck to eſcape to Oran, and was taken under the protection of the marquis of Gomarez, who ſent immediate advice of it to Charles V. then lately arrived in Spain, with a powerful fleet and army. That monarch immediately ordered the young king a ſuccour of 10,000 men, under the command of the governor of Oran; who, under the guidance of Abuchen Men, began his march towards Tremecen; and in their way they were joined by prince Selim, with a great number of Arabs and Moors. The firſt thing they reſolved upon was, to attack the important fortreſs of *Calau*, ſituated between Tremecen and Algiers, and commanded by the corſair Eſcander at the head of about 300 Turks. They inveſted it cloſely on all ſides, in hopes Barbaroſſa would come out of Tremecen to its relief, which would give the Tremecenians an opportunity of keeping him out. That tyrant, however, kept cloſe in his capital, being embaraſſed by his fears of a revolt, and the politic delays of the king of Fez, who had not ſent the auxiliaries he promiſed. The garriſon of Calau, in the mean time, made a brave defence; and, in a ſally they made at night, cut off near 300 Spaniards. This encouraged them to venture a ſecond time; but they were now repulſed with great loſs, and Eſcander himſelf wounded:

ſoon

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soon after which, they surrendered upon honourable terms; but were all massacred by the Arabians, except 16, who clung close to the stirrups of the king, and of the Spanish general.

Barbarossa being now informed that Abuchen Men, with his Arabs, accompanied by the Spaniards, were in full march to lay siege to Tremecen, thought proper to come out, at the head of 1500 Turks and 5000 Moorish horse, in order to break his way through the enemy; but he had not proceeded far from the city, before his council advised him to return and fortify himself in it. This advice was now too late; the inhabitants being resolved to keep him out, and open their gates to their own lawful prince as soon as he appeared. In this distress Barbarossa saw no way left but to retire to the citadel, and there defend himself till he could find an opportunity of stealing out with his men and all his treasure. Here he defended himself vigorously; but his provisions failing him, he took advantage of a subterraneous back-way, which he had caused to be digged up for that purpose, and, taking his immense treasure with him, stole away as secretly as he could. His flight, however, was soon discovered; and he was so closely pursued, that to amuse, as he hoped, the enemy, he caused a great deal of his money, plate, jewels, &c. to be scattered all the way, thinking they would not fail to stop their pursuit to gather it up. This stratagem, however, failed, through the vigilance of the Spanish commander, who being himself at the head of the pursuers, obliged them to march on, till he was come up close to him on the banks of the *Huexda*, about eight leagues from Tremecin. Barbarossa had just crossed the river with his vanguard, when the Spaniards came up with his rear on the other side, and cut them all off; and then crossing the water, overtook him at a small distance from it. Here a bloody engagement ensued, in which the Turks fought like as many lions;

8 Barbarossa defeated and killed by the Spaniards.

but, being at length overpowered by numbers, they were all cut to pieces, and Barbarossa among the rest, in the 44th year of his age, and four years after he had raised himself to the royal title of *Jigel* and the adjacent country; two years after he had acquired the sovereignty of Algiers, and scarce a twelvemonth after the reduction of Tremecen. His head was carried to Tremecen, on the point of a spear; and Abuchen Men proclaimed king, to the joy of all the inhabitants. A few days after the fight, the king of Fez made his appearance at the head of 20,000 horse, near the field of battle; but hearing of Barbarossa's defeat and death, marched off with all possible speed, to avoid being attacked by the enemy.

9 Succeeded by Hayradin.

The news of Barbarossa's death spread the utmost consternation among the Turks at Algiers; however, they caused his brother Hayradin to be immediately proclaimed king. The Spanish commander now sent back the emperor's forces, without making any attempt upon Algiers; by which he lost the opportunity of driving the Turks out of that country; while Hayradin, justly dreading the consequences of the tyranny of his officers, sought the protection of the Grand Signior. This was readily granted, and himself appointed bashaw or viceroy of Algiers; by which means he received such considerable reinforcements, that the unhappy Algerines durst not make the least complaint; and such numbers of Turks resorted to him, that he was not only capable of keeping the Moors and Arabs in subjection at home, but of annoying the Christians at sea. His first step was to take the Spanish fort abovementioned, which was a great nuisance to his metropolis. The Spaniards held out to the last extremity; but being all slain or wounded, Hayradin easily became master of the place.

10 He takes the Spanish fort.

Hayradin next set about building a strong mole for the safety of his ships. In this he employed 30,000 Christian slaves, whom he obliged to work without intermission for three years; in which time the work was completed. He then caused the fort he had taken from the Spaniards to be repaired, and placed a strong garrison in it, to prevent any foreign vessels from entering the harbour without giving an account of themselves. By these two important works, Hayradin soon became dreaded not only by the Arabs and Moors, but also by the maritime Christian powers, especially the Spaniards. The viceroy failed not to acquaint the Grand Signior with his success, and obtained from him a fresh supply of money, by which he was enabled to build a stronger fort, and to erect batteries on all places that might favour the landing of an enemy. All these have since received greater improvements from time to time, as often as there was occasion for them.

In the mean time the Sultan, either out of a sense of the great services Hayradin had done, or perhaps out of jealousy lest he should make himself independent, raised Hayradin to the dignity of bashaw of the empire, and appointed Hassan Aga, a Sardinian renegado, an intrepid warrior, and an experienced officer, to succeed him as bashaw of Algiers.

11 Succeeded by Hassan Aga.

Hassan had no sooner taken possession of his new government, than he began to pursue his ravages on the Spanish coast with greater fury than ever; extending them to the ecclesiastical state, and other parts of Italy. But Pope Paul III. being alarmed at this, exhorted the emperor Charles V. to send a powerful fleet to suppress those frequent and cruel piracies; and, that nothing might be wanting to render the enterprise successful, a bull was published by his holiness, wherein a plenary absolution of sins, and the crown of martyrdom, was promised to all those who either fell in battle or were made slaves; the emperor on his part needed no spur; and therefore set sail at the head of a powerful fleet consisting of 120 ships and 20 gallies, having on board 30,000 chosen troops, an immense quantity of money, arms, ammunition, &c. In this expedition many young nobility and gentry attended as volunteers, and among these many knights of Malta, so remarkable for their valour against the enemies of Christianity. Even ladies of birth and character attended Charles in his expedition, and the wives and daughters of the officers and soldiers followed them with a design to settle in Barbary after the conquest was finished. All these meeting with a favourable wind, soon appeared before Algiers; every ship displaying the Spanish colours on the stern, and another at the head, with a crucifix to serve them for a pilot.

12 Charles Vth's expedition against Algiers.

By this prodigious armament, the Algerines were thrown into the utmost consternation. The city was surrounded only by a wall with scarce any outworks. The whole garrison consisted of 800 Turks and 6000 Moors, without fire-arms, and poorly disciplined and accoutred; the rest of their forces being dispersed in the

13 Algiers in great consternation.

Algiers. the other provinces of the kingdom, to levy the uſual tribute on the Arabs and Moors. The Spaniards landed without oppoſition, and immediately built a fort, under the cannon of which they encamped, and diverted the courſe of a ſpring which ſupplied the city with water. Being now reduced to the utmoſt diſtreſs, Haſſan received a ſummons to ſurrender at diſcretion, on pain of being put to the ſword with all the garriſon. The herald was ordered to extol the vaſt power of the emperor both by ſea and land, and to exhort him to return to the Chriſtian religion. But to this Haſſan only replied, that he muſt be a madman who would pretend to adviſe an enemy, and that the adviſed muſt ſtill act more madly who would take counſel of ſuch an adviſer. He was, however, on the point of ſurrendering the city, when advice was brought him that the forces belonging to the weſtern government were in full march towards the place; upon which it was reſolved to defend it to the utmoſt. Charles, in the mean time, reſolving upon a general aſſault, kept a conſtant firing upon the town; which, from the weak defence made by the garriſon, he looked upon as already in his hands. But while the *douwan*, or Algerine ſenate, were deliberating on the moſt proper means of obtaining an honourable capitulation, a mad prophet, attended by a multitude of people, entered the aſſembly, and foretold the ſpeedy deſtruction of the Spaniards before the end of the moon, exhorting the inhabitants to hold out till that time. This prediction was ſoon accompliſhed in a very ſurpriſing and unexpected manner: for, on the 28th of October 1541, a dreadful ſtorm of wind, rain, and hail, aroſe from the north, accompanied with violent ſhocks of earthquakes, and a diſmal and univerſal darkneſs both by ſea and land; ſo that the ſun, moon, and elements, ſeemed to combine together for the deſtruction of the Spaniards. In that one night, ſome ſay in leſs than half an hour, 86 ſhips and 15 galleys were deſtroyed, with all their crews and military ſtores; by which the army on ſhore was deprived of all means of ſubſiſting in theſe parts. Their camp alſo, which ſpread itſelf along the plain under the fort, was laid quite under water by the torrents which deſcended from the neighbouring hills. Many of the troops, by trying to remove into ſome better ſituation, were cut in pieces by the Moors and Arabs; while ſeveral galleys, and other veſſels, endeavouring to gain ſome neighbouring creeks along the coaſts, were immediately plundered, and their crews maſſacred by the inhabitants.

14 Prevented by a mad prophet from ſurrendering.

15 Spaniſh fleet deſtroyed by a ſtorm.

The next morning Charles beheld the ſea covered with the fragments of ſo many ſhips, and the bodies of men, horſes, and other creatures, ſwimming on the waves; at which he was ſo diſheartened, that abandoning his tents, artillery, and all his heavy baggage, to the enemy, he marched at the head of his army, though in no ſmall diſorder, towards cape *Malabux*, in order to reimbark in thoſe few veſſels which had outweathered the ſtorm. But Haſſan, who had cauſed his motions to be watched, allowed him juſt time to get to the ſhore, when he ſallied out and attacked the Spaniards in the midſt of their hurry and confuſion to get into their ſhips, killing great numbers, and bringing away a ſtill greater number of captives; after which he returned in triumph to Algiers, where he celebrated with great rejoicings his happy deliverance from ſuch diſtreſs and danger.

16 Siege of Algiers raiſed.

Soon after this, the prophet *Yuſef*, who had foretold the deſtruction of the Spaniards, was not only declared the deliverer of his country, but had a conſiderable gratuity decreed him, with the liberty of exerciſing his prophetic function unmoleſted. It was not long, however, before the marabouts, and ſome interpreters of the law, made a ſtrong oppoſition againſt him; remonſtrating to the baſhaw, how ridiculous and ſcandalous it was to their nation, to aſcribe the deliverance of it to a poor fortune-teller, which had been obtained by the fervent prayers of an eminent ſaint of their own profeſſion. But though the baſhaw and his douwan ſeemed, out of policy, to give into this laſt notion, yet the impreſſion which Yuſef's predictions and their late accompliſhments had made upon the minds of the common people, proved too ſtrong to be eradicated; and the ſpirit of divination and conjuring has ſince got into ſuch credit among them, that not only their great ſtateſmen, but their prieſts, marabouts, and ſantoons, have applied themſelves to that ſtudy, and dignified it with the name of *Mahomet's Revelations*.

Algiers. 17 The mad prophet rewarded.

The unhappy Spaniards had ſcarce reached their ſhips, when they were attacked by a freſh ſtorm, in which ſeveral more of them periſhed; one ſhip in particular, containing 700 ſoldiers, beſides ſailors, ſunk in the emperor's ſight, without a poſſibility of ſaving a ſingle man. At length, with much labour, they reached the port of *Bujeyah*, at that time poſſeſſed by the Spaniards, whither Haſſan king of Tunis ſoon after repaired, with a ſupply of proviſions for the emperor, who received him graciouſly, with freſh aſſurances of his favour and protection. Here he diſmiſſed the few remains of the Malteſe knights and their forces, who embarked in three ſhattered galleys, and with much difficulty and danger reached their own country. Charles himſelf ſtaid no longer than till the 16th of November, when he ſet ſail for Carthagena, and reached it on the 25th of the ſame month. In this unfortunate expedition upwards of 120 ſhips and galleys were loſt, above 300 colonels and other land and ſea officers, 8000 ſoldiers and marines, beſides thoſe deſtroyed by the enemy on the reimbarkation, or drowned in the laſt ſtorm. The number of priſoners was ſo great, that the Algerines ſold ſome of them, by way of contempt, for an onion per head.

18 Freſh calamities of the Spaniards.

Haſſan, elated with this victory, in which he had very little ſhare, undertook an expedition againſt the king of Tremecen, who, being now deprived of the aſſiſtance of the Spaniards, was forced to procure a peace by paying a vaſt ſum of money, and becoming tributary to him. The baſhaw returned to Algiers, laden with riches; and ſoon after died of a fever, in the 66th year of his age.

19 Haſſan reduces Tremecen.

From this time the Spaniards were never able to annoy the Algerines in any conſiderable degree. In 1555, they loſt the city of Bujeyah, which was taken by *Salha Rais*, Haſſan's ſucceſſor; who next year ſet out on a new expedition, which he kept a ſecret, but was ſuſpected to be intended againſt Oran: but he was ſcarcely got four leagues from Algiers, when the plague, which at that time raged violently in the city, broke out in his groin, and carried him off in 24 hours.

20 Bujeyah taken from the Spaniards.

Immediately after his death the Algerine ſoldiery choſe a Corſican renegado, Haſſan Corſo, in his room, till they ſhould receive farther orders from the Porte.

21 Haſſan Corſo choſen baſhaw by the Janiſaries.

He

Algiers. He did not accept of the baſhawſhip without a good deal of difficulty; but immediately proſecuted the intended expedition againſt Oran, diſpatching a meſſenger to acquaint the Porte with what had happened. They had hardly begun their hoſtilities againſt the place, when orders came from the Porte, expreſsly forbidding Haſſan Corſo to begin the ſiege, or, if he had begun it, enjoining him to raiſe it immediately. This news was received with great grief by the whole fleet and army, as they thought themſelves ſure of ſucceſs, the garriſon being at that time very weak. Nevertheleſs, as they dared not diſobey, the ſiege was immediately raiſed.

22 Superſeded by Tekelli, who puts him to a cruel death. Corſo had hardly enjoyed his dignity four months, before news came, that eight galleys were bringing a new baſhaw to ſucceed him; one *Tekelli*, a principal Turk of the Grand Signior's court: upon which the Algerines unanimouſly reſolved not to admit him. By the treachery of the Levantine ſoldiers, however, he was admitted at laſt, and the unfortunate Corſo thrown over a wall in which a number of iron hooks were fixed; one of which catching the ribs of his right ſide, he hung three days in the moſt exquiſite torture before he expired.

Tekelli was no ſooner entered upon his new government, than he behaved with ſuch cruelty and rapaciouſneſs, that he was aſſaſſinated even under the dome of a ſaint, by Yuſef Calabres, the favourite renegado of Haſſan Corſo; who for this ſervice was unanimouſly choſen baſhaw, but died of the plague ſix days after his election.

23 Haſſan reinſtated. Yuſef was ſucceeded by Haſſan the ſon of Hayradin, who had been formerly recalled from his baſhawſhip, when he was ſucceeded by Selha-Rais; and now had the good fortune to get himſelf reinſtated in his employment. Immediately on his arrival, he engaged in a war with the Arabs, by whom he was defeated

24 Spaniards defeated with great ſlaughter. with great loſs. The next year, the Spaniards undertook an expedition againſt Moſtagan, under the command of the count d'Alcandela; but were utterly defeated, the commander himſelf killed, and 12,000 taken priſoners. This diſaſter was owing to the inconſiderate raſhneſs, or rather madneſs, of the commander; which was ſo great, that, after finding it impoſſible to rally his ſcattered forces, he ruſhed, ſword in hand, into the thickeſt of the enemy's ranks, at the head of a ſmall number of men, crying out, "St Jago! St Jago! the victory is ours, the enemy is defeated;" ſoon after which he was thrown from his horſe, and trampled to death.

Haſſan having had the misfortune to diſoblige his ſubjects by allowing the mountaineers of Cuco to buy ammunition at Algiers, was ſent in irons to Conſtantinople, while the aga of the Janiſaries, and general

25 Haſſan ſent in irons to Conſtantinople. of the land forces, ſupplied his place.—Haſſan eaſily found means to clear himſelf; but a new baſhaw was appointed, called Achmet; who was no ſooner arrived, than he ſent the two deputy-baſhaws to Conſtantinople, where their heads were ſtruck off.—Achmet was a man of ſuch inſatiable avarice, that, upon his arrival at Algiers, all ranks of people came in ſhoals to make him preſents; which he the more greedily accepted, as he had bought his dignity by the money he had amaſſed while head gardener to the Sultan. He enjoyed it, however, only four months; and after his death, the ſtate was governed other four months by his lieutenant; when Haſſan was a third time ſent viceroy to Algiers, where he was received with the greateſt demonſtrations of joy. Algiers. 26 Reinſtated.

27 Siege of Marſalquiver. The firſt enterpriſe in which Haſſan engaged, was the ſiege of Marſalquiver, ſituated near the city Oran, which he deſigned to inveſt immediately after. The army employed in this ſiege conſiſted of 26,000 foot and 10,000 horſe, beſides which he had a fleet conſiſting of 32 galleys and galliots, together with three French veſſels laden with biſcuit, oil, and other proviſions. The city was defended by Don Martin de Cordova, brother of the Count d'Alcandela, who had been taken priſoner in the battle where that nobleman was killed, but had obtained his liberty from the Algerines with immenſe ſums, and now made a moſt gallant defence againſt the Turks. The city was attacked with the utmoſt fury by ſea and land, ſo that ſeveral breaches were made in the walls. The Turkiſh ſtandards were ſeveral times planted on the walls, and as often diſlodged; but the place muſt have in the end ſubmitted, had not Haſſan been obliged to raiſe the ſiege in haſte, on the news that the famed Genoeſe admiral Doria was approaching with conſiderable ſuccours from Italy. The fleet accordingly arrived ſoon after; but miſſing the Algerine gallies, bore away for Pennon de Velez, where they were ſhameſully repulſed by an handful of Turks who garriſoned that place; which, however, was taken the following year.

28 Haſſan again recalled. In 1567, Haſſan was again recalled to Conſtantinople, where he died three years after. He was ſucceeded by Mahomet, who gained the love of the Algerines by ſeveral public-ſpirited actions. He incorporated the Janiſaries and Levantine Turks together, and by that means put an end to their diſſenſions, which laid the foundation of the Algerine independency on the Porte. He likewiſe added ſome conſiderable fortifications to the city and caſtle, which he deſigned to

29 John Gaſcon's bold attempt to fire the Algerine fleet. render impregnable. But while he was thus ſtudying the intereſt of Algiers, one John Gaſcon, a bold Spaniſh adventurer, formed a deſign of ſurpriſing the whole piratic navy in the bay, and ſetting them on fire in the night-time, when they lay defenceleſs, and in their firſt ſleep. For this he had not only the permiſſion of king Philip II. but was furniſhed by him with proper veſſels, mariners, and fireworks, for the execution of his plot. With theſe he ſet ſail for Algiers in the moſt proper ſeaſon, *viz.* the beginning of October, when moſt, if not all the ſhips lay at anchor there; and eaſily ſailed near enough, unſuſpected, to view their manner of riding, in order to catch them napping, at a time when the greater part of their crew were diſperſed in their quarters. He came accordingly, unperceived by any, to the very mole-gate, and diſperſed his men with their fire-works; but to their great ſurpriſe, they found them ſo ill mixed, that they could not with all

30 His bravado at the city gate. their art make them take fire. In the mean time, Gaſcon took it into his head, by way of bravado, to go to the mole-gate, and give three loud knocks at it with the pommel of his dagger, and to leave it fixed in the gate by its point, that the Algerines might have cauſe to remember him. This he had the good fortune to do without meeting with any diſturbance or oppoſition: but it was not ſo with his men; for no ſooner did they find their endeavours unſucceſsful, than they made ſuch a buſtle as quickly alarmed the guard poſted on the adjacent

Algiers. jacent baſtion, from which the uproar quickly ſpread itſelf thro' the whole garriſon. Gaſcon, now finding

31 Is taken and put to death.

himſelf in the utmoſt danger, ſailed away with all poſſible haſte: but he was purſued, overtaken, and brought back a priſoner to Mahomet; who no ſooner got him into his power, than he immediately cauſed a gibbet of conſiderable height to be erected on the ſpot where Gaſcon had landed, ordering him to be hoiſted up, and hung by the feet to a hook, that he might die in exquiſite torture; and to ſhow his reſentment and contempt of the king his maſter, he ordered his commiſſion to be tied to his toes. He had not, however, hung long in that ſtate, when the captain who took him, accompanied by a number of other corſairs, interceded ſo ſtrongly in his behalf, that he was taken down, and put under the care of ſome Chriſtian ſurgeons; but two days after, ſome Moors reporting that it was the common talk and belief in Spain, that the Algerines durſt not hurt a hair of Gaſcon's head, *&c.* the unfortunate Spaniard was hoiſted up by a pulley to the top of the execution-wall, and let down again upon the hook, which in his fall catched him by the belly, and gave him ſuch a wound, that he expired without a groan.——Thus ended the expedition of John Gaſcon, which has procured him a place among the Spaniſh martyrs; while, on the other hand, the Algerines look upon his diſappointment to have been miraculous, and owing to the efficacious protection of the powerful ſaint *Sidi Outededda*, whoſe prayers had before raiſed ſuch a terrible ſtorm againſt the Spaniſh fleet.

Mahomet, being ſoon after recalled, was ſucceeded by the famous renegado Ochali, who reduced the kingdom of Tunis; which, however, remained ſubject to the viceroy of Algiers only till the year 1586, when a baſhaw of Tunis was appointed by the Porte.

The kingdom of Algiers continued to be governed, till the beginning of the ſeventeenth century, by viceroys or baſhaws appointed by the Porte; concerning whom we find nothing very remarkable, further than that their avarice and tyranny was intolerable both to the Algerines and the Turks themſelves. At laſt the Turkiſh Janiſaries and militia becoming powerful enough to ſuppreſs the tyrannic ſway of theſe baſhaws, and the people being almoſt exhauſted by the heavy taxes laid upon them, the former reſolved to depoſe theſe petty tyrants, and ſet up ſome officers of their own at the head of the realm. The better to ſucceed in this attempt, the militia ſent a deputation of ſome of their chief members to the Porte, to complain of the avarice and oppreſſion of theſe baſhaws, who ſunk both the revenue of the ſtate, and the money remitted to it from Conſtantinople, into their own coffers, which ſhould have been employed in keeping up and paying the ſoldiery; by which means they were in continual danger of being overpowered by the Arabians and Moors, who, if ever ſo little aſſiſted by any Chriſtian power, would hardly fail of driving all the Turks out of the kingdom. They repreſented to the Grand Vizir how much more honourable, as well as eaſier and cheaper, it would be for the Grand Signior to permit them to chooſe their own dey, or governor, from among themſelves, whoſe intereſt it would then be to ſee that the revenue of the kingdom was rightly applied in keeping up its forces complete, and in ſupplying all other exigencies of the ſtate, without any farther charge or trouble to the Porte than that of allowing them its protection. On their part, they engaged always to acknowledge the Grand Signiors as their ſovereigns, and to pay them their uſual allegiance and tribute, to reſpect their baſhaws, and even to lodge and maintain them and their retinue, in a manner ſuitable to their dignity, at their own charge. The baſhaws, however, were, for the future, to be excluded from aſſiſting at any but general douwans, unleſs invited to it; and from having the liberty of voting in them, unleſs when their advice was aſked, or the intereſt of the Porte was likely to ſuffer by their ſilence. All other concerns, which related to the government of Algiers, were to be wholly left under the direction of the dey and his douwan.

32 Algerines allowed to chuſe their own deys.

Theſe propoſals having been accepted by the Porte, the deputies returned highly ſatisfied; and having notified their new privileges, the great *douwan* immediately proceeded to the election of a dey from among themſelves. They compiled a new ſet of laws, and made ſeveral regulations for the better ſupport and maintenance of this new form of government, to the obſervation of which they obliged all their ſubjects to ſwear; and the militia, navy, commerce, &c. were all ſettled pretty nearly on the footing upon which they now are, and which ſhall be afterwards deſcribed; tho' the ſubſequent altercations that frequently happened between the baſhaws and deys, the one endeavouring to recover their former power, and the other to curtail it, cauſed ſuch frequent complaints and diſcontents at the Ottoman court, as made them frequently repent their compliance.

In the year 1601, the Spaniards, under the command of Doria the Genoeſe admiral, made another attempt upon Algiers, in which they were more fortunate than uſual, their fleet being only driven back by contrary winds, ſo that they came off without loſs. In 1609, the Moors being expelled from Spain, flocked in great numbers to Algiers; and as many of them were very able ſailors, they undoubtedly contributed to make the Algerine fleet ſo formidable as it became ſoon after; tho' it is probable the frequent attempts made on their city would alſo induce them to increaſe their fleet. In 1616, their fleet conſiſted of 40 ſail of ſhips between 200 and 400 tons, their admiral 500 tons. It was divided into two ſquadrons, one of 18 ſail, before the port of Malaga; and the other at the Cape of Santa Maria, between Liſbon and Seville; both of which fell foul on all Chriſtian ſhips, both Engliſh and French, with whom they pretended to be in friendſhip, as well as Spaniards and Portugueſe, with whom they were at war.

33 They grow formidable to the Europeans.

The Algerines were now become very formidable to the European powers. The Spaniards, who were moſt in danger, and leaſt able to cope with them, ſolicited the aſſiſtance of England, the pope, and other ſtates. The French, however, were the firſt who dared to ſhow their reſentment of the perfidious behaviour of theſe miſcreants; and in 1617, M. Beaulieu was ſent againſt them with a fleet of 50 men of war, who defeated their fleet, took two of their veſſels, while their admiral ſunk his own ſhip and crew, rather than fall into his enemies hands.

In 1620, a ſquadron of Engliſh men of war was ſent againſt Algiers, under the conduct of Sir Robert Manſel;

Algiers. Manfel: but of this expedition we have no other account, than that it returned without doing any thing; and the Algerines, becoming more and more infolent, openly defied all the European powers, the Dutch only excepted; to whom, in 1625, they fent a propofal, directed to the prince of Orange, that in cafe they would fit out 20 fail of fhips the following year, upon any good fervice againft the Spaniards, they would join them with 60 fail of their own.

34 An English fquadron fent againft the Algerines.

The next year, the *Coulolies*, or *Cologlies* (the children of fuch Turks as had been permitted to marry at Algiers), who were enrolled in the militia, having feized on the citadel, had well nigh made themfelves mafters of the city; but were attacked by the Turks and renegadoes, who defeated them with terrible flaughter. Many fcores of them were executed; and their heads thrown in heaps upon the city-walls, without the eaftern gate. Part of the citadel was blown up; and the remaining Coulolies were difmiffed from the militia, to which they were not again admitted till long after.

35 States of Barbary throw off their dependence on the Porte.

In 1623, the Algerines and other ftates of Barbary threw off their dependence on the Porte altogether, and fet up for themfelves. What gave occafion to this was the 25 years truce which Sultan Amurath IV. was obliged to make with the emperor Ferdinand II. to prevent his being overmatched by carrying on a war againft him and the fophi of Perfia at the fame time. As this put a ftop to the piratical trade of the Algerines, they proceeded as above-mentioned; and refolved, that whoever defired to be at peace with them, muft, diftinctly and feparately, apply to their government.—No fooner was this refolution taken, than the Algerines began to make prizes of feveral merchant fhips belonging to powers at peace with the Porte. Nay, having feized a Dutch fhip and poleacre at Scanderoon, they ventured on fhore; and finding the town abandoned by the Turkifh aga and inhabitants, they plundered all the magazines and warehoufes, and fet them on fire.—About this time Lewis XIII. undertook to build a fort on their coafts, inftead of one formerly built by the Marfilians, and which they had demolifhed. This, after fome difficulty, he accomplifhed; and it was called the *Baftion of France:* but the fituation being afterwards found inconvenient, the French purchafed the port of La Calle, and obtained liberty to trade with the Arabians and Moors. The Ottoman court, in the mean time, was fo much embarraffed with the Perfian war, that there was no leifure to check the Algerine piracies. This gave an opportunity to the vizir and other courtiers to compound matters with the Algerines, and to get a fhare of their prizes, which were very confiderable. However, for form's fake, a fevere reprimand, accompanied with threats, was fent them; to which they replied, that "thefe depredations deferved to be indulged to them, feeing they were the only bulwark againft the Chriftian powers, efpecially againft the Spaniards, the fworn enemies of the Moflem name:" adding, that "if they fhould pay a punctilious regard to all that could purchafe peace, or liberty to trade with the Ottoman empire, they would have nothing to do but fet fire to all their fhipping, and turn camel-drivers for a livelihood."

In the year 1635, four younger brothers of a good family in France, entered into an undertaking fo defperate, that perhaps the annals of knight-errantry can fcarce furnifh its equal.—This was no lefs than to retort the piracies of the Algerines upon themfelves; and as they indifcriminately took the fhips of all nations, fo were thefe heroes indifcriminately to take the fhips belonging to Algiers; and this with a fmall frigate of ten guns!—In this ridiculous undertaking, 100 volunteers embarked; a Maltefe commiffion was procured, together with an able mafter, and 36 mariners.—They had the good fortune, on their firft fetting out, to take a fhip laden with wine, on the Spanifh coaft: with which they were fo much elated, that three days after they madly encountered two large Algerine corfairs, one of 20 and the other of 24 guns, both well manned, and commanded by able officers. Thefe two large veffels having got the fmall frigate between them, plied her furioufly with great fhot, which foon took off her main maft: notwithftanding which, the French made fo defperate a refiftance, that the pirates were not able to take them, till the noife of their fire brought up five more Algerines; when the French veffel, being almoft torn to pieces, was boarded and taken. The young knights-errant were punifhed for their temerity by a dreadful captivity, from which they redeemed themfelves in 1642 at the price of 6000 dollars.

Algiers. 36 Defperate undertaking of four younger brothers.

The Algerines profecuted their piracies with impunity, to the terror and difgrace of the Europeans, till the year 1652; when a French fleet being accidentally driven to Algiers, the admiral took it into his head to demand a releafe of all the captives of his nation, without exception. This being refufed, the Frenchman without ceremony carried off the Turkifh viceroy, and his cadi or judge, who were juft arrived from the Porte, with all their equipage and retinue. The Algerines, by way of reprifal, furprifed the Baftion of France already mentioned, and carried off the inhabitants to the number of 600, with all their effects; which fo provoked the admiral, that he fent them word that he would pay them another vifit the next year with his whole fleet.

37 A French admiral carries off the Turkifh bafhaw.

The Algerines, undifmayed by the threats of the French admiral, fitted out a fleet of 16 galleys and galliots, excellently manned and equipped, under the command of Admiral Hali Pinchinin.—The chief defign of this armament was againft the treafure of Loretto; which, however, they were prevented by contrary winds from obtaining. Upon this they made a defcent on Puglia in the kingdom of Naples; where they ravaged the whole territory of Necotra, carrying off a vaft number of captives, and among them fome nuns. From thence fteering towards Dalmatia, they fcoured the Adriatic; and loading themfelves with immenfe plunder, left thofe coafts in the utmoft confternation and refentment.

38 The Algerines fit out a formidable fleet,

At laft the Venetians, alarmed at fuch terrible depredations, equipped a fleet of 28 fail, under the command of admiral Capello, with exprefs orders to burn, fink, or take, all the Barbary corfairs he met with, either on the open feas, or even in the Grand Signior's harbours, purfuant to a late treaty of peace with the Porte. On the other hand, the captain bafhaw, who had been fent out with the Turkifh fleet to chafe the Florentine and Maltefe cruifers out of the Archipelago, underftanding that the Algerine fquadron was fo near, fent exprefs orders to the admiral to come to his affiftance. Pinchinin readily agreed; but having firft refolved on a defcent upon the ifland of Liffa, or Lifina,

39 Which is totally deftroyed by the Venetians.

Algiers.

na, belonging to the Venetians, he was overtaken by Capello, from whom he retired to Valona, a sea-port belonging to the Grand Signior, whither the Venetian admiral pursued him; but the Turkish governor refusing to eject the pirates according to the articles of the peace between the Ottoman court and Venice, Capello was obliged to content himself with watching them for some time. Pinchinin was soon weary of restraint, and ventured out; when an engagement immediately ensued, in which the Algerines were defeated, and five of their vessels disabled; with the loss of 1500 men, Turks, and Christian slaves; besides 1600 galley-slaves who regained their liberty. Pinchinin, after this defeat, returned to Vallona, where he was again watched by Capello; but the latter had not lain long at his old anchorage before he received a letter from the senate, desiring him to make no farther attempt on the pirates at that time, for fear of a rupture with the Porte. This was followed by a letter from the governor of Valona, desiring him to take care lest he incurred the Sultan's displeasure by such insults. The brave Venetian was forced to comply; but, resolving to take such a leave of the Algerines as he thought they deserved, observed how they had reared their tents, and drawn their booty and equipage along the shore. He then kept firing among their tents, while some well-manned galliots and brigantines were ordered among their shipping, who attacked them with such bravery, that, without any great loss, they towed out their 16 galleys, with all their cannon, stores, &c.—In this last engagement, a ball from one of the Venetian galleys happening to strike a Turkish mosque, the whole action was considered as an insult upon the Grand Signior. To conceal this, Capello was ordered to sink all the Algerine ships he had taken, except the admiral; which was to be conducted to Venice, and laid up as a trophy. Capello came off with a severe reprimand; but the Venetians were obliged to buy, with 500,000 ducats, a peace from the Porte. The Grand Signior offered to repair the loss of the Algerines by building ten galleys for them, upon condition that they should continue in his service till the end of the ensuing summer; but Pinchinin, who knew how little the Algerines chose to lie under obligations to him, civilly declined the offer.

40 Algiers in the utmost confusion at the news.

In the mean time, the news of this defeat and loss filled Algiers with the utmost grief and confusion. The whole city was on the point of a general insurrection, when the bashaw and douwan issued out a proclamation, forbidding, not only complaints and outcries, under the severest penalties; but all persons whatever to *take their thumbs from within their girdles*, while they were deliberating on this important point. In the mean time, they applied to the Porte for an order, that the Venetians settled in the Levant should make up their loss. But with this the Grand Signior refused to comply, and left them to repair their losses, as well as build new ships, in the best manner they could. It was not long, however, before they had the satisfaction to see one of their corsairs land, with a fresh supply of 600 slaves, whom he had brought from the coast of Iceland, whither he had been directed by a miscreant native taken on board a Danish ship.

41 They set out a new fleet.

Our pirates did not long continue in their weak and defenceless state; being able, at the end of two years, to appear at sea with a fleet of 65 sail. The admiral Pinchinin equipped four galliots at his own expence; with which, in conjunction with the Chiayah, or secretary of the bashaw of Tripoli, he made a second excursion. This small squadron, consisting of five galleys and two brigantines, fell in with an English ship of 40 guns; which, however, Pinchinin's captains refused to engage; but being afterwards reproached by him for their cowardice, they swore to attack the next Christian ship which came in their way. This happened to be a Dutch merchantman, of 28 guns and 40 men, deeply laden, and unable to use her sails by reason of a calm. Pinchinin immediately summoned her to surrender; but receiving an ironical answer, drew up his squadron in form of an half-moon, that they might pour their shot all at once into their adversary. This, however, the Dutchman avoided, by means of a breeze of wind which fortunately sprung up and enabled him to turn his ship; upon which the galleys ran foul of each other.—Upon this, Pinchinin ran his own galley along side of the merchantman, the upper deck of which 70 Algerines immediately took possession of, some of them cutting the rigging, and others plying the hatches with hand-grenadoes: but the Dutchmen having secured themselves in their close quarters, began to fire at the Algerines on board, from two pieces of cannon loaded with small shot; by which they were all soon killed, or forced to submit. Pinchinin, in the mean time, made several unsuccessful attempts to relieve his men, as well as to surround the Dutchman with his other galleys: but that ship lay so deep in the water, that every shot did terrible execution among the pirates; so that they were obliged to remove farther off. At last the Dutch captain, having ordered his guns to be loaded with cartouches, gave them such a parting volley as killed 200 of them, and sent the rest back to Algiers in a most dismal plight.

42 Five of their galleys defeated by a Dutch merchantman.

But though Pinchinin thus returned in disgrace, the rest of the fleet quickly came back with vast numbers of slaves, and an immense quantity of rich spoils; insomuch that the English, French, and Dutch, were obliged to cringe to the mighty Algerines, who sometimes vouchsafed to be at peace with them, but swore eternal war against Spain, Portugal, and Italy, whom they looked upon as the greatest enemies to the Mahometan name. At last Lewis XIV. provoked by the grievous outrages committed by the Algerines on the coasts of Provence and Languedoc, ordered, in 1681, a considerable fleet to be fitted out against them, under the Marquis du Quesne, vice-admiral of France. His first expedition was against a number of Tripolitan corsairs; who had the good fortune to outrow him, and shelter themselves in the island of Scio belonging to the Turks. This did not, however, prevent him from pursuing them thither, and making such terrible fire upon them as quickly destroyed 14 of their vessels, besides battering the walls of the castle.

43 Preparations against Algiers by Lewis XIV.

This severity seemed only to be designed as a check to the piracies of the Algerines; but, finding they still continued their outrages on the French coast, he sailed to Algiers in August 1682, cannonading and bombarding it so furiously, that the whole town was in flames in a very little time. The great mosque was battered down, and most of the houses laid in ruins, insomuch that the inhabitants were on the point of abandoning the place; when on a sudden the wind turned about, and

44 Algiers bombarded and set on fire by the French.

Algiers. and obliged Du Quesne to return to Toulon. The Algerines immediately made reprisals, by sending a number of galleys and galliots to the coasts of Provence, where they committed the most dreadful ravages, and brought away a vast number of captives: upon which a new armament was ordered to be got ready at Toulon and Marseilles against the next year; and the Algerines, having received timely notice, put themselves into as good a state of defence as the time would allow.

45 Algerines commit dreadful ravages in France.

46 The city again bombarded.

In May 1683, Du Quesne with his squadron cast anchor before Algiers; where, being joined by the Marquis D'Affranville, at the head of five stout vessels, it was resolved to bombard the town next day. Accordingly 100 bombs were thrown into it the first day, which did terrible execution; while the besieged made some hundred discharges of their cannon against them, without doing any considerable damage. The following nights the bombs were again thrown into the city in such numbers, that the dey's palace and other great edifices were almost destroyed; some of their batteries were dismounted, and several vessels sunk in the port. The dey and Turkish bashaw, as well as the whole soldiery, alarmed at this dreadful havock, immediately sued for peace. As a preliminary, the immediate surrender was insisted on of all Christian captives who had been taken fighting under the French flag; which being granted, 142 of them were immediately delivered up, with a promise of sending him the remainder as soon as they could be got from the different parts of the country. Accordingly Du Quesne sent his commissary-general and one of his engineers into the town; but with express orders to insist upon the delivery of all the French captives without exception, together with the effects they had taken from the French; and that Mezomorto their then admiral, and Hali Rais one of their captains, should be given as hostages.

This last demand having embarrassed the dey, he assembled the douwan, and acquainted them with it: upon which Mezomorto fell into a violent passion, and told the assembly, that the cowardice of those who sat at the helm had occasioned the ruin of Algiers; but that, for his part, he would never consent to deliver up any thing that had been taken from the French. He immediately acquainted the soldiery with what had passed; which so exasperated them, that they murdered the dey that very night, and on the morrow chose Mezomorto in his place. This was no sooner done, than he cancelled all the articles of peace which had been made, and hostilities were renewed with greater fury than ever.

47 Set on fire and almost destroyed.

The French admiral now kept pouring in such volleys of bombs, that, in less than three days, the greatest part of the city was reduced to ashes, and the fire burnt with such vehemence, that the sea was enlightened with it for more than two leagues round. Mezomorto, unmoved at all these disasters, and the vast number of the slain, whose blood ran in rivulets along the streets; or rather, grown furious and desperate, fought only how to wreak his revenge on the enemy; and, not content with causing all the French in the city to be cruelly murdered, ordered their consul to be tied hand and foot, and fastened alive to the mouth of a mortar, from whence he was shot away against their navy.— By this piece of inhumanity Du Quesne was so exasperated, that he did not leave Algiers till he had utterly destroyed all their fortifications, shipping, almost all the lower part, and above two thirds of the upper part, of the city; by which means it became little else than an heap of ruins. Algiers.

48 Algerines sue for peace.

The haughty Algerines were now thoroughly convinced that they were not invincible; and, therefore, immediately sent an embassy into France, begging in the most abject terms for peace; which Lewis immediately granted, to their inexpressible joy. They now began to pay some regard to other nations, and to be a little cautious how they wantonly incurred their displeasure. The first bombardment by the French had so far humbled the Algerines, that they condescended to enter into a treaty with England; which was renewed, upon terms very advantageous to the latter, in 1686. It is not to be supposed, however, that the natural perfidy of the Algerines would disappear on a sudden: notwithstanding this treaty, therefore, they lost no opportunity of making prizes of the English ships when they could conveniently come at them. Upon some infringement of this kind, Captain Beach drove ashore and burnt seven of their frigates in 1695; which produced a renewal of the treaty five years after: but it was not till the taking of Gibraltar and Port Mahon, that Britain could have a sufficient check upon them to enforce the observation of treaties; and these have since proved such restraints upon Algiers, that they still continue to pay a greater deference to the English than to any European power.

49 Seven of their ships burnt by capt. Beach.

50 Expulsion of the Turkish bashaw.

The present century furnishes no very remarkable events with regard to Algiers; except the taking of the famed city of Oran from the Spaniards in 1708 (which however they regained in 1737), and the expulsion of the Turkish bashaw, and uniting his office to that of dey in 1710. This introduced the form of government which still continues in Algiers.

51 Revenues, &c. of the Dey.

The dey is now absolute monarch; and pays no other revenue to the Porte, than that of a certain number of fine boys or youths, and some other presents which are sent thither yearly. His own income, probably, rises and falls according to the opportunities he hath of fleecing both natives and foreigners; whence it is variously computed by different authors. Dr Shaw computes the taxes of the whole kingdom to bring into the treasury no more than 300,000 dollars; but supposes that the eighth part of the prizes, the effects of those persons who die without children, joined to the yearly contributions raised by the government, presents from foreigners, fines and oppressions, may bring in about as much more. Both the dey, and officers under him, enrich themselves by the same laudable methods of rapine and fraud; which it is no wonder to find the common people practising upon one another, and especially upon strangers, seeing they themselves are impoverished by heavy taxes and the injustice of those who are in authority.

We have already hinted, that the first deys were elected by the militia, who were then called the *douwan*, or common-council. This elective body was at first composed of 800 militia-officers, without whose consent the dey could do nothing; and upon some urgent occasions, all the officers residing in Algiers, amounting to above 1500, were summoned to assist. But since the deys, who may be compared to the Dutch

Algiers.

Stadtholders, have become more powerful, the douwan is principally compofed of 30 chiak-bafhaws, or colonels, with now and then the mufti and cadi upon fome emergencies; and, on the election of a dey, the whole foldiery are allowed to come and give their votes. All the regulations of ftate ought to be determined by that affembly, before they pafs into a law, or the dey hath power to put them in execution: but, for many years back, the douwan is of fo little account, that it is only convened out of formality, and to give affent to what the dey and his chief favourites have concerted beforehand. The method of gathering the votes in this auguft affembly is perfectly agreeable to the character of thofe who compofe it. The aga, or general of the janizaries, or the prefident *pro tempore*, firft propofes the queftion; which is immediately repeated with a loud voice by the chia-bafhaws, and from them echoed again by four officers called *bafhaldalas*, from thefe the queftion is repeated from one member of the douwan to another, with ftrange contortions, and the moft hideous growlings, if it is not to their liking. From the loudnefs of this growling noife, the aga is left to guefs as well as he can whether the majority of the affembly are pleafed or difpleafed with the queftion; and from fuch a prepofterous method, it is not furprifing that thefe affemblies fhould feldom end without fome tumult or diforder. As the whole body of the militia is concerned in the election of a new dey, it is feldom carried on without blows and bloodfhed: but when once the choice is made, the perfon elected is faluted with the words Alla Barick, "God blefs you, and profper you;" and the new dey ufually caufes all the officers of the douwan who had oppofed his election to be ftrangled, filling up their places with thofe who had been moft zealous in promoting it. From this account of the election of the deys, it cannot be expected that their government fhould be at all fecure; and as they arrive at the throne by tumult, diforder, and bloodfhed, they are generally deprived of it by the fame means, fcarcely one in ten of them having the good fortune to die a natural death.

52 Strange method of gathering the votes of the douwan.

In this country it is not to be expected that juftice will be adminiftered with any degree of impartiality. The Mahometan foldiery, in particular, are fo much favoured, that they are feldom put to death for any crime, except rebellion; in which cafe they are either ftrangled with a bow-ftring, or hanged to an iron hook. In leffer offences, they are fined, or their pay ftopped; and if officers, they are reduced to the ftation of common foldiers, from whence they may gradually raife themfelves to their former dignity. Women guilty of adultery, have a halter tied about their necks, with the other end faftened to a pole, by which they are held under water till they are fuffocated. The baftinado is likewife inflicted for fmall offences; and is given either upon the belly, back, or foles of the feet, according to the pleafure of the cadi; who alfo appoints the number of ftrokes. Thefe fometimes amount to 200 or 300, according to the indulgence the offender can obtain either by bribery or friends; and hence he often dies under this punifhment, for want of powerful enough advocates. But the moft terrible punifhments are thefe inflicted upon the Jews or Chriftians who fpeak againft Mahomet or his religion; in which cafe, they muft either turn Mahometan, or be impaled alive. If they afterwards apoftatize, they are burned or roafted alive, or elfe thrown down from the top of the city-walls, upon iron hooks, where they are caught by different parts of their body, according as they happen to fall, and fometimes expire in the greateft torments; though by accident they may be put out of pain at once, as we have already related of the Spanifh adventurer John Gafcon. This terrible punifhment, however, begins now to be be difufed.

53 Punifhments, &c.

The officer next in power to the dey is the aga of the janizaries, who is one of the oldeft officers in the army, and holds his poft only for two months. He is then fucceeded by the chiah, or next fenior officer.—During the two months in which the aga enjoys his dignity, the keys of the metropolis are in his hands; all military orders are iffued out in his name; and the fentence of the dey upon any offending foldier, whether capital or not, can only be executed in the court of his palace.—As foon as he is gone through this fhort office, he is confidered as *mazoul*, or fuperannuated; receives his pay regularly, like the reft of the militia, every two moons; is exempt from all further duties, except when called by the dey to affift at the grand council, to which he hath, however, a right to come at all times, but hath no longer a vote in it.—Next to the aga in dignity, is the fecretary of ftate, who regifters all the public acts; and after him are the 30 chiahs, or colonels, who fit next to the aga in the douwan, and in the fame gallery with him. Out of this clafs are generally chofen thofe who go embaffadors to foreign courts, or who difperfe the dey's orders throughout the realm.—Next to them are 800 bolluck-bafhaws, or eldeft captains, who are promoted to that of chiah-bafhaws, according to their feniority. The oldack-bafhaws, or lieutenants, are next; who amount to 400, and are regularly raifed to the rank of captains in their turn, and to other employments in the ftate, according to their abilities. Thefe, by way of diftinction, wear a leather ftrap, hanging down to the middle of their back. One rule is ftrictly obferved in the rotation of thefe troops from one deputy to a higher; viz. the right of feniority; one fingle infringement of which would caufe an infurrection, and probably coft the dey his life. Other military officers of note are the vekelards, or purveyors of the army; the peys, who are the four oldeft foldiers, and confequently the neareft to preferment; the foulacks, who are the next in feniority to them, and are part of the dey's body-guard, always marching before him when he takes the field, and diftinguifhed by their carbines and gilt fcymiters, with a brafs gun on their caps; the kayts, or Turkifh foldiers, each band of whom have the government of one or more adowars, or itinerant villages, and collect their taxes for the dey; and the fagiards, or Turkifh lancemen, 100 of whom always attend the army, and watch over the water appointed for it. To thefe we may add the beys, or governors of the three great provinces of the realm. All the above-mentioned officers ought to compofe the great douwan or council above-mentioned; but only the 30 chiah-bafhaws have a right to fit in the gallery next after the dey: The reft are obliged to ftand on the floor of the hall, or council-chamber, with their arms acrofs, and, as much as poffible, without motion; neither are they permitted to enter with their fwords on, for fear of a tumult. As for thofe who

Algiers.

54 Aga of the janizaries and other military officers.

Algiers. who have any matters to tranfact with the douwan, they muft ftand without, let the weather be ever fo bad; and there they are commonly prefented with coffee by fome of the inferior officers, till they are difmiffed.

55 Divifion of the kingdom.

The kingdom of Algiers is at prefent divided into three provinces or diftricts, viz. the eaftern, weftern, and fouthern. The eaftern, or Levantine government, which is by far the moft confiderable of the three, aud is alfo called *Beylick*, contains the towns of Bona, Conftantina, Gigeri, Bujeyah, Steffa, Tebef, Zamoura, Bifcara, and Necanz, in all which the Turks have their garrifons: befides which, it includes the two ancient kingdoms of Cuco and Labez, though independent of the Algerine government, to whofe forces their country is inacceffible; fo that they ftill live under their own cheyks chofen by each of their adowars or hords. To thefe we may add a French factory at Callo, under the direction of the company of the French Baftion.—The weftern government hath the towns of Oran, Tremecen, Moftagan, Tenez, and Secrelly with its caftle and garrifon.—The fouthern government hath neither town, village, nor even a houfe, all the inhabitants living in tents, which obliges the dey and his forces to be always encamped.

56 Rivers.

The moft confiderable rivers of Algiers are the Zha, or Ziz, which runs acrofs the province of Tremecen, and the defert of Anguid, falling into the Mediterranean near the town of Tabecrita, where it has the name of *Sirut*. (2.) The Haregol, fuppofed the *Sign* of Ptolemy, comes down from the great Atlas, croffes the defert of Anguid, and falls into the fea, about five leagues from Oran. (3.) The Mina, fuppofed the *Chylematis* of Ptolemy, a large river, which runs through the plains of Bathala, and falls into the fea near the town of Arzew. This river hath lately received the name of *Cena*, who rebuilt the town of Bathalah after it had been deftroyed. (4.) The Shellif, Zilef, or Zilif, defcending from the mount Gnanexeris, runs through fome great deferts, the lake Titteri, the frontiers of Tremecen and Tenez, falling into the fea a little above the city of Moftagan. (5.) The Celef, fuppofed to be the *Carthena* of the ancients, falls into the fea about three leagues weft of Algiers, after a fhort courfe of 18 or 20 leagues. (6.) The Hued-al-quivir, fuppofed to be the *Nalabata*, or *Nafaba*, of the ancients, and called by the Europeans *Zinganir*, runs down with a fwift courfe, through fome high mountains of Cuco, and falls into the fea near Bujeyah.

57 Harbour of Bujeyah cleared by accident.

Whilft the city of Bujeyah was in the hands of the Chriftians, the mouth of this river was fo choaked up with fand, that no veffel could come up into it: but in 1555, very foon after it was taken by the Moors, the great rains fwelled it to fuch a degree, that all the fand and mud was carried off; fo that galleys, and other veffels, have ever fince entered it with eafe, where they lie fafe from ftorms, and all winds, but that which blows from the north. (7.) Suf-Gemar, or Suf-Gimmar al Rumniel, fuppofed to be the *Ampfaga* of Ptolemy, hath its fource on mount Auras, on the confines of Atlas; thence runs through fome barren plains, and the fruitful ones of Conftantina, where its ftream is greatly increafed by fome other rivers it receives; from thence running northward, along the ridges of fome high mountains, it falls into the fea a little eaft of Gigeri. (8.) The Ladag, or Ludeg, runs down from mount Atlas through part of Conftantina, and falls into the fea a little eaftward of Bona. (9.) Guadi, or Guadel Barbar, fprings from the head of Orbus, or Urbs, in Tripoli, runs through Bujeyah, and falls into the fea near Tabarea.

58 Account of the corfairs, commerce, &c.

Befides thefe there are many others of lefs note; of which, however, we do not find that the Algerines avail themfelves as they might do, their genius leading them too much to the piratical trade to mind any real advantage that might be derived from their own country. The corfairs, or pirates, form each a fmall republic, of which the rais or captain is the fupreme bafhaw; who, with the officers under him, form a kind of douwan, in which every matter relating to the veffel is decided in an arbitrary way. Thefe corfairs are chiefly inftrumental in importing whatever commodities are brought into the kingdom either by way of merchandife or prizes. Thefe confift chiefly of gold and filver ftuffs, damafks, cloths, fpices, tin, iron, plated brafs, lead, quickfilver, cordage, fail-cloth, bullets, cochineal, linen, tartar, alum, rice, fugar, foap, cotton raw and fpun, copperas, aloes, brazil and logwood, vermilion, &c. Very few commodities, however, are exported from this part of the world: the oil, wax, hides, pulfe, and corn produced, being but barely fufficient to fupply the country; though, before the lofs of Oran, the merchants have been known to fhip off from one or other of the ports of Barbary feveral thoufand tons of corn. The confumption of oil, though here in great abundance, is likewife fo confiderable in this kingdom, that it is feldom permitted to be fhipped off for Europe. The other exports confift chiefly in oftriches feathers, copper, ruggs, filk fafhes, embroidered handkerchiefs, dates, and Chriftian flaves. Some manufactures in filk, cotton, wool, leather, &c. are carried on in this country, but moftly by the Spaniards fettled here, efpecially about the metropolis. Carpets are alfo a manufacture of the country, which, though much inferior to thofe of Turkey, both in beauty and finenefs, are preferred by the people to lie upon, on account of their being both cheaper and fofter. There are alfo, at Algiers, looms for velvet, taffaties, and other wrought filks; and a coarfe fort of linen is likewife made in moft parts of the kingdom. The country furnifhes no materials for fhip-building. They have neither ropes, tar, fails, anchors, nor even iron. When they can procure enough of new wood to form the main timbers of a fhip, they fupply the reft from the materials of prizes which they have made; and thus find the fecret of producing new and fwift failing veffels from the ruins of the old. Of all the ftates on the coaft of Barbary, the Algerines are the ftrongeft at fea.

58 Inhabitants.

The inhabitants along the fea-coafts are a mixture of different nations; but chiefly Moors and Morefcos driven out of Catalonia, Arragon, and other parts of Spain. Here are alfo great numbers of Turks, who come from the Levant to feek their fortune; as well as multitudes of Jews and Chriftians taken at fea, who are brought hither to be fold for flaves. The Berebers are fome of the moft ancient inhabitants of the country; and are fuppofed to be defcended from the ancient Sabeans, who came hither from Arabia Felix, under the conduct of one of their princes. Others be-

lieve

lieve them to be ſome of the Canaanites driven out of Paleſtine by Joſhua. Theſe are diſperſed all over Barbary, and divided into a multitude of tribes under their reſpective chiefs: moſt of them inhabit the mountainous parts; ſome range from place to place, and live in tents, or portable huts; others in ſcattered villages: they have, nevertheleſs, kept themſelves for the moſt part from intermixing with other nations. The Bercbers are reckoned the richeſt of all, go better cloathed, and carry on a much larger traffic of cattle, hides, wax, honey, iron, and other commodities. They have alſo ſome artificers in iron, and ſome manufacturers in the weaving branch.—The name of *Bereber* is ſuppoſed to have been originally given them on account of their being firſt ſettled in ſome deſert place. Upon their increaſing in proceſs of time, they divided themſelves into five tribes, probably on account of religious differences, called the *Zinhagians*, *Muſamedins*, *Zeneti*, *Hoares*, and *Gomeres;* and theſe having produced 600 families, ſubdivided themſelves into a great number of petty tribes.—To theſe we may add the *Zwowahs*, by European authors called *Azuagues*, or *Aſſagues*, who are likewiſe diſperſed over moſt parts of Barbary and Numidia. Great numbers of theſe inhabit the mountainous parts of Cuco, Labez, &c. leading a wandering paſtoral life.—But the moſt numerous inhabitants are the Moors and Arabians. The former are very ſtout and warlike, and ſkilful horſemen; but ſo addicted to robbing, that one cannot ſafely travel along the country at a diſtance from the towns without a guard, or at leaſt a marabout or ſaint for a ſafeguard. For as they look upon themſelves to be the original proprietors of the country, and not only as diſpoſſeſſed by the reſt of the inhabitants, but reduced by them to the loweſt ſtate of poverty, they make no ſcruple to plunder all they meet by way of repriſal. The inhabitants, in general, have a pretty fair complexion; they are robuſt and well proportioned. People of diſtinction wear their beard; they have rich clothes made of ſilk, embroidered with flowers of gold, and turbans enriched with jewels. The Turks, who compoſe the military force, have great privileges, pay no taxes, are never publicly puniſhed, and rarely in private. The loweſt ſoldier domineers over the moſt diſtinguiſhed Moors at pleaſure. If he finds them better mounted than himſelf, he exchanges horſes without ceremony. The Turks alone have the privilege of carrying fire-arms. Many good qualities, however, diſtinguiſh them in ſpite of this exceſs of deſpotiſm. They never game for money, not even for trifles; and they never profane the name of the Deity. They ſoon forget their private quarrels; and after the firſt paroxyſm of reſentment is over, it is infamy for a Turk to keep in remembrance the injuries he has received. In this reſpect certainly they are leſs barbarous than other nations that boaſt of their civilization. See Moors.

Algiers, a city, the capital of the above kingdom, is probably the ancient *Icoſium:* by the Arabians called *Algezair*, or rather *Al-Jezier*, or *Al-Jezerah*, i. e. *the iſland*, becauſe there was an iſland before the city, to which it hath been ſince joined by a mole. It is built on the declivity of a hill by the ſea-ſide, in the form of an amphitheatre: at ſea, it looks like the topſail of a ſhip. The tops of the houſes are quite flat and white; inſomuch, that when it is firſt diſcovered, one would take it to be a place where they bleach linen. One houſe riſes above another in ſuch a manner that they do not hinder each other's proſpect. The ſtreets are ſo narrow, that they will ſcarce admit two perſons to walk a-breaſt, and the middle part is lower than the ſides. When any loaded beaſts, ſuch as camels, horſes, mules, or aſſes, paſs along, you are forced to ſtand up cloſe to the wall to let them paſs by. There is but one broad ſtreet, which runs through the city from eaſt to weſt, in which are the ſhops of the principal merchants, and the market for corn and other commodities. The lower part of the walls of the city are of hewn ſtone, and the upper part of brick; they are 30 feet high on the land ſide, and 40 towards the ſea; the foſſes or ditches are twenty feet broad, and ſeven deep. There is no ſweet water in the city; and tho' there is a tank or ciſtern in every houſe, yet they often want water, becauſe it rains but ſeldom: the chief ſupply is from a ſpring on a hill, the water of which is conveyed by pipes to above a hundred fountains, at which a bowl is faſtened for the uſe of paſſengers. The common reſervoir is at the end of the mole, where the ſhips take in their water. Every one takes his turn at theſe places, except the Turks, who are firſt, and the Jews laſt. There are five gates, which are open from ſun-riſing till ſun-ſetting; and ſeven forts, or caſtles, without the walls, the greateſt of which is on the mole without the gate, all of which are well ſupplied with great guns. There are ten large moſques, and fifty ſmall ones; three great colleges or public ſchools, and a great number of petty ones for children. The houſes are ſquare, and built of ſtone and brick, with a ſquare court in the middle, and galleries all round. There are ſaid to be about 100,000 inhabitants in the city, comprehending 5000 Jewiſh families, beſides Chriſtians. There are four fundics, or public inns, ſuch as are in Turkey; and ſix cazernes, or barracks, for the unmarried Turkiſh ſoldiers, which will hold 600 each. There are no inns for Chriſtians to lodge at; but only a few tippling huts kept by ſlaves, for the accommodation of Greeks and the poorer ſort of travellers, where any thing may be had for money. Here are bagnios, or public baths, in the ſame manner as in Turkey, at a very moderate rate. The women have baths of their own, where the men dare not come. Without the city there are a great number of ſepulchres, as alſo cells or chapels, dedicated to marabouts, or reputed ſaints, which the women go to viſit every Friday. The Turkiſh ſoldiers are great tyrants; for they not only turn others out of the way in the ſtreets, but will go to the farm-houſes in the country for twenty days together, living on free quarters, and making uſe of every thing, not excepting the women. The Algerines eat, as in Turkey, ſitting croſs-legged round a table about four inches high, and uſe neither knives nor forks; before they begin, every one ſays *Be iſme Allah*, "In the name of God." When they have done, a ſlave pours water on all their hands as they ſit, and then they waſh their mouths. Their drink is water, ſherbet, and coffee. Wine is not allowed, though drank immoderately by ſome. The proſpect of the country and ſea from Algiers is very beautiful, being built on the declivity of a mountain; but the city, though for ſeveral ages it has braved ſome of the greateſt powers in Chriſtendom, it is ſaid, could make but a faint defence againſt a regular ſiege; and that

that three English fifty-gun ſhips might batter it about the ears of its inhabitants from the harbour. If ſo, the Spaniards muſt have been very deficient either in courage or conduct. They attacked it in the year 1775, by land and by ſea, but were repulſed with great loſs; though they had near 20,000 foot and 2000 horſe, and 47 king's ſhips of different rates and 346 tranſports. In the year 1783 and 1784, they alſo renewed their attacks by ſea to deſtroy the city and galleys; but, after ſpending a quantity of ammunition, bombs, &c. were forced to retire without either its capture or extinction. The mole of the harbour is 500 paces in length, extending from the continent to a ſmall iſland where there is a caſtle and large battery. E. Long. 3. 30. N. Lat. 36. 40.

ALGOL, a fixed ſtar of the third magnitude, called *Meduſa's Head*, in the conſtellation Perſeus; its longitude is 21° 50′ 42″ of Taurus, and its latitude 23° 23′ 47″ north; according to Flamſtead's catalogue. For an account of its changes, period, and other circumſtances, ſee ASTRONOMY (*Index*).

ALGONQUINS, a nation in North America, who formerly poſſeſſed great tracts of land along the north ſhore of the river St Lawrance. For a long time they had no rivals as hunters and warriors, and were long in alliance with the Iroquois; whom they agreed to protect from all invaders, and to let them have a ſhare of their veniſon. The Iroquois, on the other hand, were to pay a tribute to their allies, out of the culture of the earth; and to perform for them all the menial duties, ſuch as flaying the game, curing the fleſh, and dreſſing the ſkins. By degrees, however, the Iroquois aſſociated in the hunting matches and warlike expeditions of the Algonquins; ſo that they ſoon began to fancy themſelves as well qualified, either for war or hunting, as their neighbours. One winter, a large detachment of both nations having gone out a-hunting, and ſecured, as they thought, a vaſt quantity of game, ſix young Algonquins and as many Iroquois were ſent out to begin the ſlaughter. The Algonquins, probably become a little jealous of their aſſociates, upon ſeeing a few elks, deſired the Iroquois to return, on pretence that they would have ſufficient employment in flaying the game they ſhould kill; but after three days hunting, having killed none, the Iroquois exulted, and in a day or two privately ſet out to hunt for themſelves. The Algonquins were ſo exaſperated at ſeeing their rivals return laden with game, that they murdered all the hunters in the night-time. The Iroquois diſſembled their reſentment; but in order to be revenged, applied themſelves to ſtudy the art of war as practiſed among thoſe ſavage nations. Being afraid of engaging with the Algonquins at firſt, they tried their prowefs on other inferior nations, and, when they thought themſelves ſufficiently expert, attacked the Algonquins with ſuch diabolical fury, as ſhowed they could be ſatisfied with nothing leſs than the extermination of the whole race; which, had it not been for the interpoſition of the French, they would have accompliſhed.—The few Algonquin nations that are now to be ſeen, ſeem entirely ignorant of agriculture, and ſubſiſt by fiſhing and hunting. They allow themſelves a plurality of wives; notwithſtanding which, they daily decreaſe in populouſneſs, few or none of their nations containing above 6000 ſouls, and many of them not 2000. Their language is one of the three radical ones in North America, being underſtood from the river St Lawrance to the Miſſiſſippi.

ALGOR, with phyſicians, an unuſual coldneſs in any part of the body.

ALGORITHM, an Arabic word expreſſive of numerical computation.

ALGUAZIL, in the Spaniſh polity, an officer whoſe buſineſs it is to ſee the decrees of a judge executed.

ALHAGI, in botany, the trivial name of a ſpecies of hedyſarum. See HEDYSARUM.

ALHAMA, a very pleaſant town of the kingdom of Granada, in Spain, ſituated in the midſt of ſome craggy mountains, about 25 miles S. W. of Granada, on the banks of the Rio Frio, in W. Long. 1. 10. N. Lat. 36. 59. and having the fineſt warm baths in all Spain. It was taken from the Moors in 1481. The inhabitants, though ſurpriſed, and the town without a garriſon, made a gallant defence: but being at length forced to ſubmit, the place was abandoned to the pillage of the Chriſtian ſoldiers; who, not ſatisfied with an immenſe quantity of gold and jewels, made ſlaves of upwards of 3000 of the inhabitants.

ALHAMBRA, the ancient fortreſs and reſidence of the Mooriſh monarchs of Granada. It derives its name from the red colour of the materials which it was originally built with, Alhambra ſignifying a red houſe. It appears to a traveller a huge heap of as ugly buildings as can well be ſeen, all huddled together, ſeemingly without the leaſt intention of forming *one* habitation out of them. The walls are entirely unornamented, all gravel and pebbles, daubed over with plaſter by a very courſe hand: yet this is the palace of the Mooriſh kings of Granada, indiſputably the moſt curious place within that exiſts in Spain, perhaps in the world. In many countries may be ſeen excellent modern as well as ancient architecture, both entire and in ruins; but nothing to be met with any where elſe can convey an idea of this edifice, except the decorations of an opera, or the tales of the genii.

Paſſing round the corner of the emperor's palace, one is admitted at a plain unornamented door in a corner. On my firſt viſit, ſays Mr Swinburne, I confeſs I was ſtruck with amazement, as I ſtept over the threſhold, to find myſelf on a ſudden tranſported into a ſpecies of fairy land. The firſt place you come to is the court called the *communa* or *del meſucar*, that is the *common baths;* an oblong ſquare, with a deep baſon of clear water in the middle; two flights of marble ſteps leading down to the bottom; on each ſide a parterre of flowers, and a row of orange-trees. Round the court runs a periſtyle paved with marble; the arches bear upon very ſlight pillars, in proportions and ſtyle different from all the regular orders of architecture. The ceilings and walls are incruſtated with fret-work in ſtucco, ſo minute and intricate, that the moſt patient draughtſman would find it difficult to follow it, unleſs he made himſelf maſter of the general plan. This would facilitate the operation exceedingly; for all this work is frequently and regularly repeated at certain diſtances, and has been executed by means of ſquare moulds applied ſucceſſively, and the parts joined together with the utmoſt nicety. In every diviſion are Arabic ſentences of different lengths, moſt

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of

Alhambra. of them expreſſive of the following meanings: "There is no conqueror but God;" or, "Obedience and honour to our Lord Abouabdoula." The ceilings are gilt or painted, and time has cauſed no diminution in the freſhneſs of their colours, though conſtantly expoſed to the air. The lower part of the walls is moſaic, diſpoſed in fantaſtic knots and feſtoons. A work ſo novel, ſo exquiſitely finiſhed, and ſo different from all that he had ever ſeen, muſt afford a ſtranger the moſt agreeable ſenſations while he treads this magic ground. The porches at the ends are more like grotto-work than any thing elſe to which they can be compared. That on the right hand opens into an octagon vault, under the emperor's palace, and forms a perfect whiſpering gallery, meant to be a communication between the offices of both houſes.

Oppoſite to the door of the communa through which you enter, is another leading into the *quarto de los leones*, or apartment of the lions; which is an oblong court, 100 feet in length and 50 in breadth, environed with a colonnade 7 feet broad on the ſides and 10 at the end. Two porticos or cabinets about 15 feet ſquare, project into the court at the two extremities. The ſquare is paved with coloured tiles; the colonnade with white marble. The walls are covered five feet up from the ground with blue and yellow tiles, diſpoſed chequerwiſe. Above and below is a border of ſmall eſcutcheons, enamelled blue and gold, with an Arabic motto on a bend; ſignifying, "No conqueror but God." The columns that ſupport the roof and gallery are of white marble, very ſlender, and fantaſtically adorned. They are 9 feet high, including baſe and capital, and 8½ inches diameter. They are very irregularly placed; ſometimes ſingly, at others in groups of three, but more frequently two together. The width of the horſe-ſhoe arches above them is four feet two inches for the large ones, and three for the ſmaller. The ceiling of the portico is finiſhed in a much finer and more complicated manner than that of the communa, and the ſtucco laid on the walls with inimitable delicacy; in the ceiling it is ſo artfully froſted and handled as to exceed belief. The capitals are of various deſigns, though each deſign is repeated ſeveral times in the circumference of the court, but not the leaſt attention has been paid to placing them regularly or oppoſite to each other. Not the ſmalleſt repreſentation of animal life can be diſcovered amidſt the varieties of foliages, groteſques, and ſtrange ornaments. About each arch is a large ſquare of arabeſques, ſurrounded with a rim of characters, that are generally quotations from the Koran. Over the pillars is another ſquare of delightful filligree work. Higher up is a wooden rim, or kind of cornice, as much enriched with carving as the ſtucco that covers the part underneath. Over this projects a roof of red tiles, the only thing that disfigures this beautiful ſquare. This ugly covering is modern, put on by order of Mr Wall, the late prime miniſter, who a few years ago gave the Alhambra a thorough repair. In Mooriſh times, the building was covered with large painted and glazed tiles, of which ſome few are ſtill to be ſeen. In the centre of the court are twelve ill-made lions muzzled, their fore parts ſmooth, their hind parts rough, which bear upon their backs an enormous baſon, out of which a leſſer riſes. While the pipes were kept in good order, a great volume of water was thrown up, that, falling down into the baſons, paſſed through the beaſts, and iſſued out of their mouths into a large reſervoir, where it communicated by channels with the jet d'eaus in the apartments. This fountain is of white marble, embelliſhed with many feſtoons and Arabic diſtichs, thus tranſlated:

"Seeſt thou not how the water flows copiouſly like the Nile?"

"This reſembles a ſea waſhing over its ſhores, threatening ſhipwreck to the mariner."

"This water runs abundantly, to give drink to the lions."

"Terrible as the lion is our king in the day of battle."

"The Nile gives glory to the king, and the lofty mountains proclaim it."

"This garden is fertile in delights: God takes care that no noxious animal ſhall approach it."

"The fair princeſs that walks in this garden, covered with pearls, augments its beauty ſo much, that thou may'ſt doubt whether it be a fountain that flows, or the tears of her admirers."

Paſſing along the colonnade, and keeping on the ſouth ſide, you come to a circular room uſed by the men as a place for drinking coffee and ſorbets in. A fountain in the middle refreſhed the apartment in ſummer. The form of this hall, the elegance of its cupola, the cheerful diſtribution of light from above, and the exquiſite manner in which the ſtucco is deſigned, painted, and finiſhed, exceed all powers of deſcription. Every thing in it inſpires the moſt pleaſing, voluptuous ideas; yet in this ſweet retreat they pretend that Abouabdoulah aſſembled the Abencerrages, and cauſed their heads to be ſtruck off into the fountain. Continuing your walk round, you are next brought to a couple of rooms at the head of the court, which are ſuppoſed to have been tribunals, or audience-chambers.

Oppoſite to the *Sala de los Abencerrages* is the entrance into the *Torre de las dos hermanas*, or the tower of the two ſiſters; ſo named from two very beautiful pieces of marble laid as flags in the pavement. This gate exceeds all the reſt in profuſion of ornaments, and in beauty of proſpect which it affords through a range of apartments, where a multitude of arches terminate in a large window open to the country. In a gleam of ſunſhine, the variety of tints and lights thrown upon this enfilade are uncommonly rich. The firſt hall is the concert-room, where the women ſate; the muſicians played above in four balconies. In the middle is a jet d'eau. The marble pavement is equal to the fineſt exiſting, for the ſize of the flags and evenneſs of the colour. The two ſiſters, which give name to the room, are ſlabs that meaſure 15 feet by 7½, without flaw or ſtain. The walls, up to a certain height, are moſaic, and above are divided into very neat compartments of ſtucco, all of one deſign, which is alſo followed in many of the adjacent halls and galleries. The ceiling is a fretted cove. To preſerve this vaulted roof, as well as ſome of the other principal cupolas, the outward walls of the towers are raiſed 10 feet above the top of the dome, and ſupport another roof over all, by which means no damage can ever be cauſed by wet weather or exceſſive heat and cold. From this hall you paſs round the little myrtle-garden of

Alhambra. of Lindaraxa, into an additional building made to the east end by Charles V. The rooms are small and low. His dear motto, *Plus outrè*, appears on every beam. This leads to a little tower, projecting from the line of the north wall, called *El tocador*, or the dressing-room of the sultana. It is a small square cabinet, in the middle of an open gallery, from which it receives light by a door and three windows. The look-out is charming. In one corner is a large marble flag, drilled full of holes, through which the smoke of perfumes ascended from furnaces below; and here, it is presumed, the Moorish queen was wont to sit to fumigate and sweeten her person. The emperor caused this pretty room to be painted with representations of his wars, and a great variety of grotesques, which appear to be copies, or at least imitations, of those in the loggie of the Vatican. From hence you go through a long passage to the hall of ambassadors, which is magnificently decorated with innumerable varieties of mosaics, and the mottos of all the kings of Granada. This long narrow antichamber opens into the communa on the left hand, and on the right into the great audience-hall in the tower of Comares; a noble apartment, 36 feet square, 36 high up to the cornice, and 18 from thence to the centre of the cupola. The walls on three sides are 15 feet thick, on the other 9; the lower range of windows 13 feet high. The whole wall is inlaid with mosaic of many colours, disposed in intricate knots, stars, and other figures. In every part various Arabic sentences are repeated.

Having thus completed the tower of the upper apartments, which are upon a level with the offices of the new palace, you descend to the lower floor, which consisted of bedchambers and summer-rooms: the backstairs and passages, that facilitated the intercourse between them, are without number. The most remarkable room below is the king's bedchamber, which communicated, by means of a gallery, with the upper story. The beds were placed in two alcoves, upon a raised pavement of blue and white tiles; but as it was repaired by Philip V. who passed some time here, it cannot be said how it may have been in former times. A fountain played in the middle, to refresh the apartment in hot weather. Behind the alcoves are small doors, that conduct you to the royal baths. These consist of one small closet with marble cisterns for washing children, two rooms for grown up persons, and vaults for boilers and furnaces that supplied the baths with water and the stoves with vapours. The troughs are formed of large slabs of white marble; the wall are beautified with party-coloured earthen ware; light is admitted by holes in the coved ceiling.

Hard by is a whispering gallery, and a kind of labyrinth, said to have been made for the diversion of the women and children. One of the passages of communication is fenced off with a strong iron grate, and called *the prison of the sultana;* but it seems more probable that it was put up to prevent any body from climbing up into the womens quarter.

Under the council-room is a long slip, called *the king's study;* and adjoining to it are several vaults, said to be the place of burial of the royal family. In the year 1574, four sepulchres were opened; but as they contained nothing but bones and ashes, were immediately closed again.

This description of the Alhambra may be finished by observing how admirably every thing was planned and calculated for rendering this palace the most voluptuous of all retirements; what plentiful supplies of water were brought to refresh it in the hot months of summer; what a free circulation of air was contrived, by the judicious disposition of doors and windows; what shady gardens of aromatic trees; what noble views over the beautiful hills and fertile plains! No wonder the Moors regretted Granada; no wonder they still offer up prayers to God every Friday for the recovery of this city, which they esteem a terrestrial paradise. See GRANADA.

Ali || Alicant.

ALI, gives the denomination to a sect, or division, among the Mahometans, who adhere to the right of succession of Ali the fourth caliph or successor of Mahomet, and to the reform of Mussulmanism introduced by him. The sectaries of Ali are more particularly called *Schiites;* and stand opposed to the *Sunnites*, or sect of Omar, who adhere to the law as left by Mahomet, Abubeker, and Omar. Ali was cousin of Mahomet, and son-in-law of that prophet, having married his daughter Fatimah. After Mahomet's death, great disputes arose about the succession. Many stood for Ali; but Abubeker was preferred, and elected the first kalif. Ali took his turn, after the death of Othman.—The Persians are the chief adherents to the sect of Ali, whom they hold to have been the legitimate successor of Mahomet, and Abubeker an usurper. On the contrary, the Turks are of the sect of Omar; and hold Ali in execration, having raised a furious civil war among the Mussulmans. The distinguishing badge of the followers of Ali is a red turban, which is worn by the Persians, who are hence called in derision, by the Turks, *Kisilbachi*, q. d. *red-heads*. Ali is reputed the author of several works, particularly a Centiloquium, in great esteem among the Arabs and Persians, part of which has been published in English by Mr Ockley.

ALJAMEIA is a name which the Moriscoes in Spain give to the language of the Spaniards. Among other articles agreed on by the junto, which was appointed by the emperor Charles V. in 1526, in favour of the Moriscoes, this was one, That the Moriscoes should no longer speak Algavareia, i. e. Moorish or Arabic; but should all speak *Aljameia*, i. e. Spanish, as it was called by the Moors, and all their writings and contracts should be in that language.

ALIAS, in law, a second or farther writ issued from the courts of Westminster, after a *capias*, &c. sued out without effect.

ALIBI, in law, denotes the absence of the accused from the place where he is charged with having committed a crime; or his being *elsewhere*, as the word imports, at the time specified.

ALICANT, a large sea-port town in the province of Valencia and territory of Segura. It is seated between the mountains and the sea, and has a castle deemed impregnable. The port is defended by three bastions furnished with artillery. To prevent the visits of the Algerine pirates, watch-towers were built to give notice of the approach of an enemy's ship. It was taken from the Moors in 1264. The castle was taken by the English in 1706, and held out a siege of two years before it was retaken by the French and Spaniards, and at last surrendered upon honourable terms, after

after part of the rock was blown up on which the castle stood, and the governor killed. The houses are high, and well built; and a very great trade is carried on here, particularly in wine and fruit. It is seated in the Mediterranean, on a bay of the same name, 37 miles north-east of Murcia, and 75 south of Valencia. W. Long. 0. 36. N. Lat. 38. 24.

ALICATA, a mountain of Sicily, near the valleys Mazara and Noto, upon which was situated (as is generally thought) the famous Dædalion, where the tyrant Phalaris kept his brazen bull.

ALICATA, a town of Sicily, remarkable for corn and good wine. It was plundered by the Turks in 1543; and is seated on a sort of peninsula near the sea, twenty-two miles S. E. of Girgenti. E. Long. 15. 20. N. Lat. 37. 11.

Alicata Chlamys, was a sort of vest with sleeves, worn by the Roman boys till the age of thirteen, at which time they put on the *prætexta*.

ALIEN, in law, implies a person born in a strange country not within the king's allegiance; in contradistinction to a denizon, or natural subject. The word is formed from the Latin *alius*, "another"; *q. d.* one born in another country. An alien is incapable of inheriting lands in Britain till naturalized by an act of parliament. No alien is intitled to vote at the election of members of parliament; nor can he enjoy any office, or be returned on any jury, unless where an alien is party in a cause, when the inquest is composed of an equal number of denizens and aliens. The reasons for establishing these laws were, that every man is presumed to bear faith and love to that prince and country where he received protection during his infancy; and that one prince might not settle spies in another's country; but chiefly, that the rents and revenues of the country might not be drawn to the subjects of another. Some have thought that the laws against aliens were introduced in the time of Henry II. when a law was made at the parliament of Wallingford, for the expulsion of strangers, in order to drive away the Flemings and Picards introduced into the kingdom by the wars of King Stephen. Others have thought that the origin of this law was more ancient; and that it is an original branch of the feudal law: for by that law no man can purchase any lands but he must be obliged to do fealty to the lords of whom the lands are holden; so that an alien who owed a previous faith to another prince, could not take an oath of fidelity in another sovereign's dominions. Among the Romans, only the *Cives Romani* were esteemed freemen; but when their territories increased, all the Italians were made free, under the name of *Latins*, tho' they had not the privilege of wearing gold rings till the time of Justinian. Afterwards all born within the pale of the empire were considered as citizens.

Alien-Duty, an impost laid on all goods imported by aliens, over and above the customs paid for such goods imported by British, and on British bottoms.

Aliens-Duty is otherwise called *petty customs*, and *navigation-duty*.—Fish dried or salted, and cod-fish or herring not caught in British vessels and cured by British, pay a double *aliens-duty*.—On what footing aliens are permitted to import foreign commodities into Great Britain, see DUTY.

Alien-Priories, a kind of inferior monasteries, formerly very numerous in England, and so called from their belonging to foreign abbeys.

ALIENATION, in law, denotes the act of making over a man's property in land, tenements, &c. to another person.

ALIENATION in mortmain, is making over lands, tenements, &c. to a body-politic, or to a religious house, for which the king's licence must first be obtained, otherwise the lands, &c. alienated will be forfeited.

Alienation in fee, is the selling the fee-simple of any land, or other incorporeal right. All persons who have a right to lands may generally alien them to others; but some alienations are prohibited: such as alienations by tenants for life, &c. whereby they incur a forfeiture of their estate. By the statute of Edward I. a bar was put to alienations by what we call *entails*, which is an expedient for procuring perpetuities in families; but counter expedients were devised to defeat this intent, and a practice was introduced of cutting off entails by fines, and of barring remainders and reversions by recoveries. The statute for alienations in Henry VII.'s time had a great effect on the constitution of this kingdom; as, among other regulations of that reign, it tended to throw the balance of power more into the hands of the people. By the stat. 12 Car. II. cap. 24. fines for alienations are taken away. Crown lands are only alienable under a faculty of perpetual redemption. The council of Lateran, held in 1123, forbids any clerk to alienate his benefice, prebend, or the like. By the laws of the ancient Jews, lands could only be alienated for the space of 50 years. At each return of the jubilee all returned again to the primitive owners, or their descendants, to whom the lands were originally allotted at the first distribution of Canaan.

Alienation-Office, is an office to which all writs of covenants and entry, upon which fines are levied, and recoveries suffered, are carried, to have fines for alienation set and paid thereon.

ALIMENT, (from *alo* to nourish), implies food both solid and liquid: from which, by the process of digestion, is prepared a very mild, sweet, and whitish liquor, resembling milk, and distinguished by the name of *chyle*; which being absorbed by the lacteal veins, by them conveyed into the circulation, and there assimilated into the nature of blood, affords that supply of nutrition which the continual waste of the body is found to require.—Next to air, food is the most necessary thing for the preservation of our bodies: and as on the choice thereof our health greatly depends, it is of great importance to understand, in general, what is the properest for our nourishment; and, in particular deviations from health, what is the best adapted to restore us. Our blood and juices naturally incline to become putrid and acrimonious: fresh chyle, duly received, prevents this destructive tendency, and preserves in them that mild state which alone consists with health. An animal diet affords the most of this bland nutritious mucilage; watery fluids dilute the too gross parts, and carry off what is become unfit for use. It is only the small portion of jelly which is separated from the farinaceous parts of vegetables, that, after being much elaborated, is converted into the animal nature; yet the use of vegetables prevents both repletion and a too great tendency to a putrescent acrimony of the blood.

blood. In hot climates, as well as against the constitutional heat of particular persons, vegetables are demanded in the largest portion; animal substances afford the highest relish while our appetite continues; but will sate the appetite before the stomach is duly filled. Vegetables may be eaten after either flesh or fish: few herbs or fruits satiate so much as that the stomach may not be filled with them, when it is already satisfied with flesh or fish; whence it may be observed, that no diet which is very nourishing can be eat to fulness, because its nutritious parts are oily and satiating.—Health depends almost wholly on a proper crasis of the blood; and to preserve this a mixture of vegetables in some degree is always required, for a loathing is soon the consequence of animal food alone: hot acrid habits, too, receive from milk and vegetables the needful for correcting their excesses; but in cold, pituitous, and nervous habits, who want most nourishment from least digestion, and from the smallest quantity of food, animal diet is to be used more freely.

Thus much being offered as general principles with respect to the matter and quality of our aliment, the valetudinarian may easily regulate his diet with some advantage to himself by an attention to the few ensuing particulars. In winter, eat freely, but drink sparingly: roast meat is to be preferred, and what is drank should be stronger than at other seasons. In summer, let thirst determine the quantity to be drunk; cold stomachs never require much: boiled meats and vegetables, if not otherwise contradicted, may now be more freely used. Lax habits require the winter's diet to be continued all the year, and rigid ones should be confined to that of summer. Fat people should fast at times, but the lean should never do so. Those who are troubled with eructations occasioned by their food, should drink but little, and use some unaccustomed exercise. The thirsty should drink freely, but eat sparingly. In general, let moderation be observed; and tho' no dinner hath been had, a light supper is at all times to be preferred. After very high-seasoned meats, a glass of water acidulated with the acid elixir of vitriol, or in very weak stomachs the sweet elixir of vitriol, is far more assistant to the work of digestion than the common method of taking brandy. See further Food and Drink.

Obligation of Aliment, in Scots law, the natural obligation on parents to provide their children with the necessaries of life, &c. See Law, Part III. N° clxxiii. 4.

Alimentarii Pueri, &c. were certain children maintained and educated by the munificence of the emperors, in a sort of public places, not unlike our hospitals. —Trajan was the first that brought up any of these *alimentary* boys. He was imitated by Adrian. Antoninus Pius did the same for a number of maids, at the solicitation of Faustina; and hence, in some medals of that empress, we read PVELLAE FAVSTINIANAE. —Alexander Severus did the like at the request of Mammæa; and the maids thus educated were called Mammæanæ.

Alimentary Duct or *Canal*, is a name given by Dr Tyson and some others to that part of the body thro' which the food passes, from its reception into the mouth to its exit at the *anus*; including the *gula*, stomach, and intestines. See Anatomy.

This duct has been said to be the true characteristic of an animal, or (in the jargon of the schools) *in proprium quarto modo*; there being no animal without it, and whatever has it being properly enough ranged under the class of animals. Plants receive their nourishment by the numerous fibres of their roots, but have no common receptacle for digesting the food received, or for carrying off the recrements. But in all, even the lowest degree of animal life, we may observe a stomach and intestines, even where we cannot perceive the least formation of any organ of the senses, unless that common one of feeling as in oysters. Phil. Transf. N° 269, p. 776, seq.

Dr Wallis brings an argument from the structure of the alimentary tube in man, to prove that he is not naturally carnivorous; to which Dr Tyson makes some objections. V. Phil. Transf. N° 269, p. 777.

Alimentary Law, *lex alimentaria*, was an old law among the Romans, whereby children were obliged to find sustenance for their parents.

ALIMONY, in law, implies that allowance which a married woman sues for, and is intitled to, upon any occasional separation from her husband. See Law, Part III. N° clx. 13.

ALIPILARIUS, or Alipilus, in Roman antiquity, a servant belonging to the baths, whose business it was, by means of waxen plasters, and an instrument called *volsella*, to take off the hairs from the arm-pits, and even arms, legs, &c. this being deemed a point of cleanliness.

ALIPTERIUM, αλειπτηριον, in antiquity, a place in the ancient *palestræ*, where the *athletæ* were anointed before their exercises.

ALIQUANT part, in arithmetic, is that number which cannot measure any other exactly without some remainder. Thus 7 is an aliquant part of 16; for twice 7 wants two of 16, and three times 7 exceeds 16 by 5.

ALIQUOT part, is that part of a number or quantity which will exactly measure it without any remainder. Thus 2 is an aliquot part of 4; 3 of 9; 4 of 16, &c.

ALISANDERS, or Alexanders, in botany. See Smyrnium.

ALISMA, or Water-Plantain: A genus of the polygynia order, belonging to the hexandria class of plants; and in the natural method ranking under the 5th order, *Tetrapetaloideæ*. The characters are: The *calyx* is a three-leaved perianthium: The *corolla* consists of three roundish, large, flat, expanding petals: The *stamina* consist of six subulated filaments shorter than the corolla; the antheræ are roundish: The *pistillum* consists of more than five germina; the styli are simple, the stigmata obtuse: The *pericarpium* consists of compressed capsulæ: The *seeds* are small and solitary. Of this genus there are eight

Species, viz. The plantago, or great water-plantain, which grows in all the marshy parts of this country; the ranunculoides, or lesser water-plantain; the natans, or creeping water-plantain; the damasonium, or star-headed water-plantain; all which are natives of Britain. The others, *viz.* the flava, cordifolia, subulata, and parnassifolia, are natives of America, where they are generally found in stagnating waters, and other swampy places; so that it would be difficult to preserve them in Britain, for they will not live in the

open air, and they require a bog to make them thrive: but as they are plants of no great beauty or use, it is not worth while to cultivate them in this country.

ALISONTIA, or ALISUNTIA, (anc. geog.); a river of Belgic Gaul, now *Alſitz;* which riſing on the borders of Lorrain, and running through the duchy, waters the city of Luxemburg, and, ſwelled by other rivulets, falls into the Sur.

ALITES, in Roman antiquity, a deſignation given to ſuch birds as afforded matter of auguries by their flight.

ALKADARII, a ſect among the Mahometans who deny any eternal, fixed, divine decrees, and are aſſerters of free will. The word is formed from the Arabic *alkadar*, which ſignifies "decree." The Alkadarii are a branch of Motazalites, and ſtand oppoſed to the Algiabarii. See ALGIABARII.

ALKAHEST, or ALCAHEST, in chemiſtry, an univerſal menſtruum capable of reſolving all bodies into their firſt principles. Van Helmont pretended he was poſſeſſed of ſuch a menſtruum; but, however credulous people might be impoſed on in his days, the notion is now become as ridiculous as the philoſopher's ſtone, the perpetuum mobile, &c.—It is likewiſe uſed by ſome authors for all fixed ſalts volatilized.

ALKALI, in chemiſtry, one of the general diviſions of ſalts, comprehending that claſs of chemical elements which, by their union with acids, form *perfect neutrals*, in oppoſition to the ſalts formed of acids with metals or earths, which are called *imperfect*.

Alkaline ſalts are divided into two kinds, the fixed and volatile; and the former into two ſpecies, vegetable, and mineral or foſſil. All of theſe poſſeſs ſome properties in common, and ſome peculiar to each.

1 Properties common to all the alkaline ſalts.

Thoſe which they have in common are, 1. An acrid and pungent taſte, which, when the ſalts are very pure and ſtrong, degenerates into abſolute cauſticity, and would entirely deſtroy the organ of ſenſation if long applied to it. 2. A tendency to diſſolve animal ſubſtances, and reduce them to a gelatinous ſubſtance, which all of them will do when very ſtrong. 3. An attraction for acids, with a power of ſeparating earths and metals from them, though previouſly combined with the ſame. 4. They change the blue vegetable juices to green; the green to yellow; the yellow to orange; the orange to red; and the red to purple. 5. They unite with oils, and deſtroy or cauſe to fade almoſt all kinds of colours that can be put upon cloth, whence their uſe in bleaching, &c.

2 Properties common to the two fixed alkalis.

The properties common to both kinds of fixed alkalis are, 1. They reſiſt the action of fire to a great degree, ſo that they can eaſily be reduced to a ſolid form by evaporating any liquid in which they happen to be diſſolved. 2. By an intenſe fire, they flow into a liquid which concretes into an hard and ſolid maſs in the cold. 3. When mixed in certain proportions with thoſe earths or ſtones called *vitrifiable*, they melt, in a heat ſtill more intenſe, into glaſs. 5. Mixed with ammoniacal ſalts, with animal ſubſtances, or with ſoot, they extricate a volatile alkali.

3 Of the volatile alkali.

The volatile alkali differs from the other two in being unable to reſiſt the fire, and being entirely reſolvable into an inviſible and permanently elaſtic fluid, called by Dr Prieſtley *alkaline air*. In conſequence of this volatility, it always affects the olfactory nerves very perceptibly, and its ſmell is the general criterion by which its ſtrength may be judged of. Its attraction for acids, power of changing colours, &c. are alſo conſiderably weaker than thoſe of the fixed alkalis.

Though two ſorts of volatile alkali are commonly ſold under the names of ſpirits of hartſhorn and of ſal ammoniac, the one differs from the other only in its degree of purity. The former is ſo called from its being originally made from the horns of deer; but this material has long been laid aſide, and the bones of horſes, the *flints*, as they are called, of the horns of cattle, the parings of hoofs, &c. have been ſubſtituted in their ſtead. This kind, however carefully prepared, always contains a portion of animal oil, the ſmell of which is very perceptible; the other, prepared from pure ſal ammoniac, is totally free of any empyreumatic ſmell, and is as pure as it can be obtained by any means whatever.

4 Effervefcence with acids not a characteriſtic of alkali.

Effervefcence with acids was formerly ſuppoſed to be a diſtinguiſhing property of alkalis, though it was always known that by a mixture with quicklime they might be deprived of this property. Dr Black, however, has ſhown, that the effervefcing with acids is no property of pure alkali, but is occaſioned only by the eſcape of fixed air from it: of conſequence, when quicklime is added, which attracts the whole or greateſt part of the fixed air, no effervefcence can be perceived. In the ſtate in which the fixed alkalis are commonly met with, indeed, effervefcence with acids may be ſaid to be an eſſential property; but this is entirely owing to the cauſe juſt mentioned, *viz.* a quantity of fixed air, to which they are united during the proceſs by which they were originally formed. The quantity of this air, however, is never ſo great as to ſaturate them entirely; on the contrary, their alkaline properties are always very perceptible, and they are commonly ſaid to be in a *mild* ſtate. But the truth is, that now they are in a kind of intermediate ſtate between what may be called perfectly mild and perfectly cauſtic. In their perfectly mild ſtate, they are united with ſuch a large quantity of fixed air as entirely overpowers their alkaline properties; and therefore they are no more intitled to the name of alkalis in this ſtate, than when combined with the marine, nitrous, or any other acid; in which caſe the compounds are called neutral ſalts. But it is a much more laborious and tedious proceſs to ſaturate an alkali completely with fixed air than with any other acid; nor does it very eaſily retain the aerial acid after it has once been combined with it. Hence the cauſtic taſte and properties of the alkali almoſt always predominate, and the ſalt contains a portion of pure and cauſtic alkali, to which alone its virtues are to be aſcribed.

5 Preparation of the vegetable alkali.

Vegetable alkali is obtained in its greateſt purity by deflagrating nitre with charcoal, provided we make uſe of no more of the latter than is barely ſufficient to deſtroy the nitrous acid. It is, however, a very difficult matter to adjuſt this proportion with ſufficient accuracy; for if we employ too much charcoal, the ſalt will be conſiderably phlogiſticated; if too little, ſome part of the nitre will remain undecompoſed. Burnt tartar therefore, purified by ſolution and filtration, may be looked upon as the beſt alkali we have. The common alkalis, or *aſhes* as they are called, and ſaid to be obtained from the aſhes of vegetables, are always mixed

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ed with much phlogifton, and fometimes with lime, falt, or other heterogeneous matters; for which reafon they are not to be employed in the nicer chemical experiments, without being purified by folution in water, by filtration, and cryftallization. The pureft of all thefe falts is that called the *blue pearl*, imported from Hungary.

6 Its peculiar properties.

The vegetable alkali when thus purified, and containing near one half its weight of fixed air, is of a white colour when dry, with a very hot and cauftic tafte, poffeffing in an eminent degree all thofe qualities which have been afcribed to the alkaline falts in general. It runs *per deliquium* when expofed to the air; and is ufually incapable of being chryftallized, though it acquires this property after being employed in the rectification of ardent fpirit. It adheres more clofely to acids than any fubftance hitherto difcovered; though, from fome experiments, Bergman was induced to believe that pure terra ponderofa attracted acids ftill more powerfully. But this has been difcovered to be a miftake by Dr Withering, who, in a paper publifhed in the 74th volume of the Philofophical Tranfactions, fhows, that unlefs where the earth is united with vitriolic acid, not only the vegetable, the foffil, but even the volatile alkali in its pure or cauftic ftate, will feparate it from any other with which it may be combined. Terra ponderofa, therefore, will always decompofe vitriolated tartar, Glauber's falt, or vitriolic ammoniac; whence the miftake of this celebrated chemift probably has proceeded. After this alkali has been once united with marine acid, it appears to have undergone fome change; for the falt then produced, by combining it with the vitriolic acid, refembles Glauber's falt almoft as much as it does vitriolated tartar. It feems therefore to have made fome approach towards the nature of foffil alkali; but chemifts have not inquired what would be the confequence of repeated combinations of this kind.

7 Of the foffil alkali.

The foffil alkali differs from the vegetable in having a fmaller attraction for acids, in being more eafily fufible by itfelf, and forming a more foluble compound with the vitriolic acid. It is alfo eafily cryftallizable, even without the addition of more fixed air than it naturally contains: and experience has determined it to be more proper for glafs or foap manufactures than the vegetable alkali; for which reafon the demand for it is very confiderable.

8 This alkali known to the ancients.

The foffil alkali was anciently called *natron* or *nitre*, and is fpoken of by Pliny and Tacitus as an ingredient in glafs, &c. and the fcriptures inform us that it was ufed in baths. The knowledge of this falt was loft in the general obfcuration of fcience which took place on the decline of the Roman empire; nor do we find it mentioned till the time of the Hon. Robert Boyle; and, even fince that time, though M du Hamel gave an accurate account of it in a memoir for the year 1736, little farther notice was taken of it till very lately.

9 Found native in many parts of the world.

We are now certainly informed that the foffil alkali is found native in many parts of the world, which never is the cafe with the vegetable alkali. The places where it abounds moft are, Egypt, the country of Tripoli in Barbary, the peak of Teneriffe in one of the Canary iflands, Hungary, feveral of the provinces of Ruffia, fome parts of Afia, particularly the neighbourhood of Smyrna, &c. though it has not hitherto been found in any of the weftern countries of Europe, excepting in the neighbourhood of volcanoes, or in mineral waters; and in thefe laft only in very fmall quantity.

10 Is the bafis of common falt.

The great fource of the mineral alkali, however, and from whence it is not improbable that the places already mentioned have been fupplied by fome unknown natural operation, is the water of the ocean. Foffil alkali is the natural bafis of fea-falt; and could any method of readily procuring it from this falt be fallen upon, it would no doubt be a moft valuable fecret. Hitherto, however, all the methods ufed with any fuccefs by the chemifts may be reduced to two. 1. By mixing the nitrous acid with fea-falt in a retort, in the proportion, according to Dr Vogel, of four of the acid to one of the falt, and diftilling off the muriatic acid, or rather aqua regia, which will be produced in the procefs. The refiduum will afford a cubical nitre by cryftallization, from whence the alkali may be obtained pure by deflagrating with charcoal. 2. By addition of vitriolic acid the fpirit of fea-falt will be expelled much more eafily, and at a cheaper rate, than by the nitrous acid. The refiduum affords Glauber's falt in great plenty: this being melted in a crucible with a fufficient quantity of charcoal-duft, forms a hepar fulphuris; which being decompofed by means of the vegetable acid, the latter may be deftroyed by force of fire, and the alkali obtained in purity. For a further explanation of both thefe methods, fee the article Chemistry, *Index*.

The demand in this country for foffil alkali is fupplied from the afhes of kali and other fea plants, from which it is feparated in the fame manner as the vegetable alkali from the afhes of other plants. The pureft kind of afhes containing this falt is called *foda* or *barilla*, and is imported chiefly from foreign countries; that which is obtained from the fea-weed growing on our own coafts, and known by the name of *kelp*, is exceffively impure, and fcarce admits of being thoroughly analyfed according to the rules of chemiftry.

11 Properties of both fixed alkalis when cauftic.

Both thefe alkalis may be deprived of their fixed air, and thus rendered pure and cauftic, by the addition of quicklime. In this ftate the difference between them is much lefs perceptible than in any other, though the addition of fixed air, or any other acid, always fhows that no effential change has taken place in either. In this highly cauftic ftate they deftroy the parts of animals in a manner fimilar to that of fire; whence they are called *potential* cauteries, as the former is called the *actual* cautery. M. Morveau informs us, that on digefting a piece of beef in a folution of cauftic vegetable alkali, the liquor foon became red, and the flefh affumed the form of a femitranfparent jelly, in which, however, one could eafily perceive the ramifications of the fmalleft fibre; and, after ftanding fome months, it emitted but very little fmell. The vegetable alkali is commonly made ufe of as the material for the common cauftic or *lapis infernalis* of the fhops; for the preparation of which, fee Chemistry, *Index*. Both alkalis attract moifture from the air when reduced to a folid form in their cauftic ftate, though neither the foffil alkali nor its combinations do fo in any other cafe. In their cauftic ftate alfo they only unite with oils, or diffolve in fpirit of wine; which laft they

they have been ſuppoſed to purify, though it is more than probable that they decompoſe and communicate diſagreeable qualities to it.

12
Volatile alkali in its mild and cauſtic ſtates.

The volatile alkali, when procured immediately by the diſtillation of any ſubſtance capable of yielding it, is obtained in a ſtate ſimilar to that in which the alkalis are uſually met with, viz. half mild and half cauſtic. By expoſing the liquid alkali to a great quantity of fixed air, we may at laſt have it perfectly mild and neutraliſed; in which ſtate it appears as a white ſalt extremely volatile, though leſs ſo than the pure cauſtic alkali. It diſſolves very readily in water; but unleſs ſome cauſtic ſpirit, or ſome lime or fixed alkali be added, in order to abſtract part of the fixed air, it will ſcarcely exhibit the characteriſtic of volatile alkali, viz. a pungent and urinous ſmell. The addition of fixed air, however, makes very little difference with regard to the chemical combinations of this ſalt; for as fixed air has a very ſlender power of acidity, it is expelled by every other acid with the greateſt eaſe, and the ſame combinations formed as though it had not been preſent. The only difference is, that when a mild alkali is added to an acid, a ſtrong effervefcence takes place by reaſon of the eſcape of the fixed air through the liquid, while with the cauſtic alkali the mixture is made quietly and without diſturbance.

The various combinations of the alkaline ſalts with the different acids, and the neutral compounds thence reſulting, are exhibited in the following table.

1. Vegetable fixed alkali combined with

Vitriolic acid	forms	Vitriolated tartar.
Nitrous acid		Nitre.
Marine acid		Sal digeſtivus.
Acetous acid		Terra foliata tartari.
Acid of tartar		Soluble tartar.
Acid of borax, Acid of phoſphorus, Saccharine acid, &c.		Anomalous ſalts, whoſe properties have not been aſcertained.
Aerial acid		Mild or aerated alkali.

2. Foſſil or mineral fixed alkali combined with

Vitriolic acid	forms	Glauber's ſalt.
Nitrous acid		Cubical nitre.
Marine acid		Common ſalt.
Acetous acid		A ſalt reſembling terra foliata tartari, but which does not deliquate.
Acid of tartar		Rochelle ſalt.
Acid of borax		Borax.
Acid of phoſphorus, Saccharine acid, &c.		Unknown ſalts.
Aerial acid		Mild foſſil alkali.

3. Volatile alkali combined with

Vitriolic acid	forms	Vitriolic ammoniac, or Glauber's ſecret ſal ammoniac.
Nitrous acid		Nitrous ammoniac, or volatile nitre.
Marine acid		Common ſal ammoniac
Acetous acid		Spiritus mindereri.

Volatile alkali combined with

Acid of tartar	forms	A ſalt whoſe properties have not been inveſtigated; which ſhoots into fine long cryſtals, and does not deliquate in the air.
Acid of borax		An anomalous ſalt.
Acid of phoſphorus		Microcoſmic ſalt, or eſſential ſalt of urine.
Saccharine acid, &c.		Anomalous ſalts.
Aerial acid		Volatile ſal ammoniac, or ſalt of hartſhorn.

13
Attractions of the alkalis for vinous ſubſtances.

Beſides their attraction for acids, the alkalis have alſo an attraction for oils, ſulphur, and ſpirit of wine, in the moiſt way, when the ſalts are deprived of their fixed air; and in this, as well as the dry way, with ſeveral metals, and vitrifiable earths and ſtones, as has been already mentioned.

With oil the vegetable fixed alkali forms a ſoap, though leſs perfect than that made with the cauſtic mineral alkali. When combined with fixed air they ſcarcely unite with oils. Boiled with ſulphur, or melted with it in their dry ſtate, they unite into a very fetid compound called *hepar ſulphuris*, which is ſoluble in water, but totally and very quickly decompoſed by the contact of air. Vegetable alkali unites with iron, tin, and zinc; corrodes copper, and runs with it into a liquor of a deep blue colour, and joins with lead in fuſion. It does not act upon gold in its metallic ſtate; but if a ſufficient quantity be added to a ſolution of gold in aqua regia, the calx of the metal will be firſt precipitated and afterwards diſſolved.

Vegetable alkali is a principal ingredient in the powders called *fluxes*, uſed for the fuſion of metalline ores. It promotes the fuſion of earths, and forms glaſs with the cryſtalline kind. It is ſoluble in an equal weight of diſtilled water; and, when expoſed to the air, it ſoon attracts moiſture from it and flows into a liquid. In its cauſtic ſtate it diſſolves in ſpirit of wine, and forms with it a red tincture called *Van Helmont's tincture of ſalt of tartar*, formerly uſed both as an internal and external remedy, but now fallen into diſrepute.

Foſſil alkali in its cauſtic ſtate unites with oil into an harder ſoap than that made with vegetable alkali. With ſulphur it forms a hepar ſulphuris in the ſame manner as the vegetable alkali, and yields a tincture with ſpirit of wine, which diſſolves part of the ſalt whilſt hot, but lets it fall again in a cryſtalline form when cold. Gold, ſilver, or quickſilver, are not affected by a ſolution of this ſalt; but copper and tin are diſſolved by it in the open air. It affects tin, lead, regulus of antimony, and cobalt, ſlightly; but acts powerfully upon zinc, and forms a kermes mineral with crude antimony. Copper, iron, biſmuth, zinc, antimony, and regulus of cobalt, fuſed with two parts of foſſil alkali, are almoſt entirely diſſolved in a very ſtrong heat; but tin, lead, and regulus of antimony, treated in the ſame manner, only ſuffer a partial ſolution.

All the alkalis are of conſiderable uſe in medicine,

 though

though the particular virtues of vegetable and foſſil alkali have not hitherto been properly aſcertained. It is probable, however, that there muſt be a conſiderable diverſity in their operations on the human body, as the vegetable alkali ſhows itſelf ſo much more acrid and powerful than the foſſil. As both of them unite immediately with acids, and change them into mild neutral ſalts; hence, if any of the ſtrong mineral acids ſhould fall upon any part of the human body, and begin to corrode and give pain, the immediate application of the lixivium tartari, or of a ſolution of any of thoſe alkaline ſalts in water, or of the ſalts themſelves in powder, will deſtroy their cauſticity, and prevent their doing further miſchief: Or if any of theſe acids ſhould drop on clothes, linen, or other ſubſtances, and alkaline ſalts are immediately applied, they will neutralize the acid, and prevent its further corroſion: Or if a perſon ſhould, through miſtake, ſwallow any of the mineral acids, or corroſive ſublimate, or any other corroding ſalt which an alkali will decompoſe, the taking down into the ſtomach ſolutions of the alkaline ſalts, or the ſalts themſelves in proper doſes, are the moſt likely means of affording relief, if not given too late (A).

14 Medical virtues of alkaline salts.

Both the vegetable and foſſil alkali applied externally in a cauſtic ſtate, firſt irritate and inflame the ſkin, and afterwards act as fire in mortifying and deſtroying it; and therefore have been much uſed by ſurgeons for opening buboes and other abſceſſes, and for eating away proud or fungous fleſh that ſprouts out from ſores. Various formulæ of cauſtic alkalis have been employed for theſe purpoſes, of which an account is given under CHEMISTRY and PHARMACY.

The alkaline ſalts, when much diluted with water, have been uſed as waſhes for removing pimples from the face; but if ſuch waſhes are continued long, they are apt to ſpoil the ſkin. The ancients often uſed to diſſolve natron (the foſſil alkali) in their baths, and eſteemed ſuch baths uſeful for removing itchings of the ſkin, the ſcab, the impetigo, leproſy, and almoſt all ſorts of cutaneous eruptions; and they employed baths of the ſame kind for promoting ſweat, and for curing various diſorders. They mixed it likewiſe with turpentine, with oils, and with ſtuffs of various kinds, and rubbed or applied ſuch compoſitions to the ſkin, for removing different complaints, to heal ſores, to ſtrengthen weak or relaxed parts, to deſtroy the poiſon of the bite of a mad dog, and of ſerpents; and they eſteemed it as an antidote againſt many other poiſons. It has been proved that alkaline ſalts preſerve animal ſubſtances from putrefaction; on which account ſome practitioners have concluded that they act as ſtrong antiſeptic remedies when ſwallowed as medicines, and are taken up by the lacteal veſſels, and by them carried to the ſubclavian vein to be mixed with the blood. Experience, however, has ſhown that they have effects directly oppoſite, and that by ſtimulating the veſſels and quickening the circulation, they contribute towards the diſſolution of the vital fluid; of which Dr Monro ſays he has ſeen ſeveral inſtances.

15 Do not act as antiſeptics when taken into the human body.

Alkalis promote the ſecretions in general, particularly by the kidneys; but by the help of warm liquors and bed-clothes, their operation may be directed towards the ſkin. They have alſo been employed in caſes of heartburn, and others where an acid prevails in the ſtomach and bowels, or where theſe organs are loaded with viſcid phlegm. They are likewiſe given with a view to aſſiſt the operation of the bile when it is too weak and inert, either by themſelves, or mixed with purgative or other medicines. The foſſil alkali has been alleged to be a more powerful ſolvent of the human calculus than the vegetable, though perhaps without any juſt foundation. It is given from 5 to 20 grains three times a-day; and in ſome caſes even to double that quantity. It may be taken in any common liquor, or in clear broth made of lean meat, from which the fat has been ſkimmed off; or the powdered ſalts may be made up into pills or boluſes mixed with liquorice powder, by means of mucilage of gum Arabic or conſerve.

16 Are of conſiderable uſe in dropſies.

The vegetable alkali has long been uſed as a diuretic in dropſies with great ſucceſs; and Dr Monro informs us, that he has ſeen a number of caſes of anaſarca in which the water was carried off by it. As diuretics, it may be taken from ten grains to half a drachm, or more, two or three times a-day, mixed with ſome diſtilled water, ſyrup, broth, or water-gruel, or with two ounces of white-wine, which partly neutralizes the ſalt. When added to infuſions of juniper-berries, broom-tops, horſe-radiſh, muſtard-ſeed, winter's-bark, &c. in wine and beer, they prove powerful diuretics; and Dr Monro gives the following formula.

"Take broom-tops, horſe-radiſh, and juniper-berries, of each an ounce; bruiſe them in a ſtone or marble mortar; put them into a large wide-mouthed bottle, and add to them an ounce of ſalt of tartar and two quarts of Rheniſh wine. Infuſe them for four days; decant off the wine, and filter it through paper for uſe. Two or three ounces may be taken three or four times a-day."

Or, "Take an ounce of canella alba, and as much muſtard-ſeed and juniper-berries; bruiſe them well in an iron mortar, and add an ounce of purified vegetable alkali with two quarts of porter: infuſe for four days, and filter the liquor through paper; let the patient take a wine-glaſs full every four or ſix hours."

The diuretic powers of theſe medicines are ſometimes increaſed by opium, and they have been ſucceſsfully joined with eſſential oils and balſams.

17 An excellent ſolvent of the ſtone.

The moſt remarkable property of theſe ſalts, however, is that of diſſolving the human calculus; for the diſcovery of which, Mrs Stephens, in the year 1740, obtained a parliamentary reward of 5000 l. At that time Dr Jurin being afflicted with the ſtone, tried a number of experiments on theſe medicines; from which he concluded, that their efficacy depended entirely on the

(A) With regard to the mineral acids, an exception ſeems to take place if oil of vitriol in its concentrated ſtate ſhould happen to be ſwallowed; for this contracts ſuch a degree of heat on the contact of any aqueous fluid as would deſtroy the patient, independent of another cauſe. An inſtance we have ſeen where a perſon unhappily miſtook a bottle of oil of vitriol for water in the night-time. He recovered by ſwallowing inſtantly a great quantity of milk. Another recovered by drinking a bottle of Florence oil.

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the alkaline falts and lime which they contained; and therefore he began to try what effects a foap-ley would have on himfelf. At firft he took only a few drops, but gradually increafed his dofe till he came to an ounce, and fometimes an ounce and a half, in a proper vehicle, in 24 hours. This produced the difcharge of fome fmall calculi, and relieved him of the fymptoms of the ftone. Dr Hartley, likewife, laboured under this complaint; and believing that the efficacy of Mrs Stephens's medicines depended on the foap, lime, and alkaline falts which they contained, ordered a pafte to be prepared for himfelf, made of eight ounces of foap, one of oyfter-fhell lime, a drachm of falt of tartar, and as much water as formed the whole into a foft mafs; of which he took large quantities, and found himfelf greatly relieved, though not cured, as a ftone was found in his bladder after his death. Thefe and other inftances of fuccefs, foon brought the medicines into general ufe: but though many found relief from them, others, particularly thofe who were afflicted with the ftone, had all the fymptoms of their diftemper aggravated, by the falts rendering the blood, and other liquors of the body, particularly the urine, fharp and acrid, fo as to irritate and inflame the bladder, which was already in too irritable a ftate, from the conftant friction of the calculus lodged within it. The late experiments of Mr Scheele and Sir Torbern Bergman, however, have made it evident, that the human calculus is compofed of a concrete acid joined to a fmall portion of animal earth. Moft people, therefore, who are afflicted with the ftone or gravel, wifh to try the efficacy of thefe remedies, rather than fubmit to the dangerous operation of lithotomy; we fhall therefore fubjoin, from Dr Monro, the following directions for making and ufing the foap-ley.

18 Monro's directions for making and ufing the foap-ley.

"Take of falt of tartar, eight ounces; of frefh quicklime, four ounces; of diftilled water, a quart: mix them all well together in a large bottle, and let them ftand for 24 hours; then pour off the ley and filter it through paper, keeping it in well-ftopped vials for ufe. Of this the dofe is from 30 drops to three or four drachms, which is to be repeated two or three times in the day.

"One of the beft methods of taking this ley is, to mix the quantity to be ufed in the day with three pints of plain broth, which has been made with the lean part of veal, with all the fat or oily parts feparated from it, by putting it, when made, into a large bowl, and fkimming them off with a fpoon when cold, and to drink, within an hour, a pint of this broth three times in the day—early in the morning—at noon—and in the evening; and to continue the ufe of this medicine for three, four, or more months; and, during this courfe, to live on fuch things as leaft counteract the operation of the medicine: to take for breakfaft fome plain broth, fuch as has been defcribed, with dry toafted bread or bifcuit; or a difh or two of tea or coffee in place of the broth: for dinner, to eat the lean part of plain boiled or roafted meat, or a fowl, with their own gravy or juice for fauce; and to eat only of vegetables which contain but little acid, fuch as potatoes, &c. and to ufe for drink toaft and water, or water with a very fmall portion of fpirit in it; and to abftain from eating fruit and acefcent vegetables, fat meat, butter, or oil; and from drinking wine, beer, cyder, punch, and in fhort from taking any thing which is likely to counteract or deftroy the effects of the ley."

With regard to the ufe of the foap-ley, our author obferves, "that he has feen a number of people who have taken it, both for gravellifh complaints and for the ftone; that many of thofe who had gravel were relieved, and fome of them feemed to be cured; that fome few of thofe who had the confirmed ftone, received confiderable relief for a time from its ufe: but the complaints afterwards returned; nor can he fay that one complete cure was made; though from the accounts given by the late Dr Whytt of Edinburgh, and others, it fhould appear that this had fometimes happened: that in many cafes of ftone the ley occafioned pain and irritation, and increafed the violence of the fymptoms fo much, that the patients were obliged to lay it afide; and that this happened moft frequently where the bladder feemed to be already difeafed from the irritation of the ftone: that at all times it is advifable to lay afide this medicine, at leaft for a time, whenever it irritates and occafions pain, or where there are appearances of its continued ufe having broken down the crafis of the blood.

19 Aerated vegetable alkali recommended.

Inftead of the foap-ley, the following folution of vegetable alkali, fully faturated with fixed air, has been lately recommended as a powerful folvent of the ftone. "Take two ounces of falt of tartar, and diffolve it in two quarts of diftilled water, and then faturate it fully with fixed air; and let the patient take eight ounces of it every eight hours. But though many cafes have been related in which this medicine is faid to have been ferviceable, our author fays he has feen only one gentleman who had taken it, and who had found confiderable relief from it. Soap-ley has likewife been recommended as a folvent of bilious calculi, and has fometimes been of fervice; but this has probably arifen more from its property of diffolving thick and vifcid humours, and affifting the action of the bile, than by acting on the calculi themfelves.

20 Medical virtues of the volatile alkali.

The volatile alkali has many of the virtues of the fixed, but affects animal fubftances, particularly in its cauftic ftate, lefs powerfully than they do. It gives a brifk and ftrong ftimulus to the nerves and fibres of living animals; and is therefore employed in difeafes where the pulfe is low and the circulation too languid; in low fevers, where the patient is in danger of finking; in apoplectic and lethargic diforders of elderly people of phlegmatic habits, in paralytic cafes, fainting fits, &c. where a brifk and ftimulating remedy is wanted. It is often ufed as a diaphoretic and fudorific in cafes of rheumatifm, in the end of fevers, catarrhs, and other difeafes, where a plentiful diaphorefis or fweat is required; and, according to our author, it is principally owing to this quality that the alkalis have obtained their reputation of being efficacious remedies againft the bites of ferpents and other venomous animals. It is equally efficacious againft mineral acid poifons with the fixed alkali.

21 Origin of alkaline falts.

It now remains only to give fome account of the origin of the alkalis, or that procefs by which they are naturally produced. This fubject, however, is very much involved in obfcurity; nor has the origin of fixed alkalis, at leaft, been inveftigated with fuch diligence and fuccefs as that of the acids. Chemifts have been divided in their opinions, whether alkaline falts be natural

tural bodies, or formed by the force of fire, uniting the principles of which they consist in the burning or distilling the substances from which they are got. It is generally supposed that they are formed by the force of fire intimately uniting an earth, an acid, and an inflammable matter together, so as to form an alkaline salt, which is supposed to be composed of these principles. In support of this opinion, it has been alleged, 1. That the fixed vegetable alkali is produced by burning vegetables which contain the principles fit for forming these salts; though no vestige of an alkali can be discovered in these vegetables in their natural state. 2. That the essential salts of vegetables, which contain an acid and an earth, on being calcined in a crucible with charcoal, yield an alkaline salt. 3. That by alternately allowing the vegetable alkali to run per deliquium, and drying it again, it precipitates a quantity of earth every time it is dissolved; so that the whole of the salt is at last reduced to this kind of earth, while the acid, phlogiston, &c. have evaporated, or been destroyed by the repeated application of heat for drying the salt. 4. In like manner the volatile alkali is produced by distilling animal substances which contain the principles fit for producing it, though no marks of a volatile alkali could be discovered in these substances while they were fresh.

On the other hand, it has been asserted, that the alkaline salts obtained by burning vegetables, or distilling animal substances, existed originally in the materials from which they are procured; that they were generated in the plants by the process of vegetation, and freed by the fire from the other principles which disguised them. In support of this opinion the following arguments are made use of by Messrs Weigleb, Rosenstiel, Morveau, &c. 1. That they had not been able to procure an alkaline salt by mixing earths, oil, and acids together, and subjecting them to the most intense fire. 2. The crystals of tartar, which were formerly believed to be pure acid salts, have been found by late experiments to contain a vegetable alkali. 3. The vegetable alkaline salt, when purified, is always of the same nature, from whatever substance it is procured; and therefore must have been an original principle or body existing in the vegetables from which it is procured: for had it been produced by art, it would have varied, and we should have had different species of it, according to the principles which the plants contained. And, 4, The neutral salts which have been found mixed with the ashes of plants, as vitriolated tartar, nitre, and sea-salt, are likewise strong proofs of the original existence of alkali in vegetables.

On this subject Dr Monro observes, that hitherto we have not sufficient evidence to determine positively whether the vegetable alkali be produced by the force of fire, or if it existed originally in the substances from which it is prepared, though he is inclined to favour the former opinion. With regard to the volatile alkali, however, we have abundant evidence of its being produced from substances which could not possibly be supposed to contain it originally. Dr Stahl assures us, that if any dry fixed alkaline salt be well rubbed in a mortar with such a quantity of oil of turpentine as is sufficient to make it of the consistence of a pulp, and digested for some weeks in a cucurbit or retort, we obtain a volatile alkali. Mr Geoffroy relates, that having placed a large retort in a sand furnace, and adapting a tubulated receiver to it, afterwards heating the bottom of the retort red hot, he put into it, by means of a long tube rising from the upper part of the neck, a powder composed of equal parts of nitre and charcoal, on which there came over into the receiver a liquor highly impregnated with volatile alkali. Cartheuser, in the first volume of his Materia Medica, tells us, that if two parts of salt of tartar be mixed with one of sulphur, and be afterwards distilled, they yield a volatile alkaline salt and spirit. Boerhaave and Macquer have both affirmed, that the vegetative process itself produces a volatile alkali; and that the juices got by bruising mustard-seed and other alkalescent vegetables, as they are called, contain a volatile alkali which effervesces with acids: but this is denied by Cartheuser and Vogel, who affirm that they could discover no traces of volatile alkali in these juices by any experiments they made.

But whatever may be concluded from the experience of former chemists, the late discoveries of Dr Priestley and Mr Cavendish have decisively shown, that the volatile alkali is by no means a simple element or natural principle, but a compound, and which may be artificially prepared. Dr Priestley informs us, that by the union of nitrous air with iron, a volatile alkali is generated; and Mr Cavendish, that by the action of the electric fluid, or pure elementary fire, upon phlogisticated air, the nitrous acid is produced: the volatile alkali, therefore, must be supposed to consist ultimately of phlogisticated air united to a great quantity of elementary fire. In like manner, if we can suppose this subtile element to enter into the substance of any kind of earth in such a manner as to exert its peculiar action when that substance is applied to any other, we may reasonably conclude that the fixed alkalis also are not simple and permanent principles, but capable of artificial composition and decomposition. It is certain that the action of alkaline salts is extremely similar to that of fire; and as we know that this element is combined in a *latent* state with fluids, there can be no absurdity in supposing it capable of combining also with solids.

See Aerology, n° 149.

See Acid, n° 7.

Alkali, or *Sal Kali*, in botany. See Salicornia.

ALKANET, in botany. See Anchusa.

ALKEKENGI, in botany, the trivial name of a species of physalis. See Physalis.

ALKENNA, in botany. See Lawsonia.

ALKERMES, in pharmacy, a compound cordial medicine made in the form of a confection, deriving its name from the kermes-berries used in its composition.

ALKORAN. See Alcoran.

ALL-Hallows. See *All-Saints*.

All-Good. See Chenopodium.

All-Heal. See Heracleum and Stachys.

All-Saints, in the calendar, denotes a festival celebrated on the first of November, in commemoration of all the saints in general; which is otherwise called *All-hallows*. The number of saints being so excessively multiplied, it was found too burdensome to dedicate a feast-day to each. In reality, there are not days enough, scarce hours enough, in the year, for this purpurpose. Hence an expedient was had recourse to, by commemorating such in the lump as had not their own days. Boniface IV. in the ninth century, introduced the

the feaſt of *All Saints* in Italy, which was ſoon after adopted into the other churches.

All-Saints Bay, a ſpacious harbour near St Salvador in Brazil, in S. America, on the Atlantic Ocean. W. long. 40°, S. lat. 12°.

All-Souls, in the calendar, denotes a feaſt-day, held on the ſecond of November, in commemoration of all the faithful deceaſed.—The feaſt of All-Souls was firſt introduced in the eleventh century, by Odilon abbot of Cluny, who enjoined it on his own order; but it was not long before it became adopted by the neighbouring churches.

ALL-SPICE. See Myrtus and Calycanthus.

ALLA, or Allah, the name by which the profeſſors of Mahometaniſm call the Supreme Being.

The term *alla* is Arabic, derived from the verb *alah*, to adore. It is the ſame with the Hebrew *Eloah*, which ſignifies the *Adorable Being*.

ALLAMANDA, in botany; a genus of the monogynia order, belonging to the pentandria claſs of plants. The characters are: The *calyx* is a five-leav'd perianthium: The *corolla* conſiſts of one funnel-ſhaped petal; the tube cylindric; the border ſemiquinquefid and ventricoſe; the diviſions expanding and obtuſe: The *ſtamina* have ſcarce any filaments; the antheræ are five, arrow-ſhap'd, converging, in the throat of the tube: The *piſtillum* has an oval germen, girt at the baſe with an annular margin; the ſtylus is filiform, the length of the tube; the ſtigma is headed, and contracted in the middle: The *pericarpium* is an orbicular, compreſs'd, briſtly capſule, containing one cell with two valves: The *ſeeds* are imbricated, orbicular, flat, with a membranaceous wing on the margin, and are very numerous. There is but one ſpecies, the cathartica, a native of Surinam.

ALLANTOIS, or Allantoides, a gut-ſhaped veſicle inveſting the fœtus of cows, goats, ſheep, &c. filled with an urinous liquor conveyed to it from the urachus.—(See Comparative *Anatomy*). Anatomiſts are not agreed whether the allantois has any exiſtence in the human ſpecies or not.

ALLATIUS (Leo), keeper of the Vatican library, a native of Scio, and a celebrated writer of the 17th century. He was of great ſervice to the gentlemen of Port Royal in the controverſy they had with M. Claude touching the belief of the Greeks with regard to the euchariſt. No Latin was ever more devoted to the ſee of Rome, or more inveterate againſt the Greek ſchiſmatics, than Allatius. He never engaged in matrimony, nor was he ever in orders; and Pope Alexander VII. having aſked him one day, why he did not enter into orders? he anſwered, "Becauſe I would be free to marry." The pope rejoined, "If ſo, why do you not marry?" "Becauſe," replied Allatius, "I would be at liberty to take orders." Thus, as Mr Bayle obſerves, he paſſed his whole life, wavering betwixt a pariſh and a wife; ſorry, perhaps, at his death, for having choſen neither of them; when, if he had fixed upon one, he might have repented his choice for 30 or 40 years.—If we believe John Patricius, Allatius had a very extraordinary pen, with which, and no other, he wrote Greek for 40 years; and we need not be ſurpriſed, that, when he loſt it, he was ſo grieved, that he could ſcarce forbear crying. He publiſhed ſeveral manuſcripts, ſeveral tranſlations of Greek authors, and ſeveral pieces of his own compoſing. In his compoſitions he is thought to ſhow more erudition than judgment: he uſed alſo to make frequent digreſſions from one ſubject to another. He died at Rome in 1669, aged 83.

ALLAY. See Alloy.

ALLEGATA, a word anciently ſubſcribed at the bottom of reſcripts and conſtitutions of the emperors; as *ſignata*, or *teſtata*, was under other inſtruments.

ALLEGEAS, or Allegias, a ſtuff manufactured in the Eaſt-Indies. There are two ſorts of them; ſome are of cotton, and others of ſeveral kinds of herbs, which are ſpun like flax and hemp. Their length and breadth are of eight ells, by five, ſix, or ſeven eighths; and of twelve ells, by three-fourths, or five-eighths.

ALLEGIANCE, in law, is the tie, or *ligamen*, which binds the ſubject to the king, in return for that protection which the king affords the ſubject. The thing itſelf, or ſubſtantial part of it, is founded in reaſon and the nature of government; the name and the form are derived to us from our Gothic anceſtors. Under the feodal ſyſtem, every owner of lands held them in ſubjection to ſome ſuperior or lord, from whom or from whoſe anceſtors the tenant or vaſſal had received them: and there was a mutual truſt or confidence ſubſiſting between the lord and vaſſal, that the lord ſhould protect the vaſſal in the enjoyment of the territory he had granted him; and, on the other hand, that the vaſſal ſhould be faithful to the lord, and defend him againſt all his enemies. This obligation on the part of the vaſſal was called his *fidelitas* or fealty: and an oath of fealty was required by the feodal law to be taken by all tenants to their landlord, which is couched in almoſt the ſame terms as our ancient oath of allegiance; except that, in the uſual oath of fealty, there was frequently a ſaving or exception of the faith due to a ſuperior lord by name, under whom the landlord himſelf was perhaps only a tenant or vaſſal. But when the acknowledgment was made to the abſolute ſuperior himſelf, who was vaſſal to no man, it was no longer called the oath of fealty, but the oath of allegiance; and therein the tenant ſwore to bear faith to his ſovereign lord, in oppoſition to all men, without any ſaving or exception. Land held by this exalted ſpecies of fealty, was called *feudum ligium*, a liege fee; the vaſſals *homines ligii*, or liege men; and the ſovereign, their *dominus ligius*, or liege lord. And when ſovereign princes did homage to each other for lands held under their reſpective ſovereignties, a diſtinction was always made between *ſimple* homage, which was only an acknowledgement of tenure; and *liege* homage, which included the fealty before-mentioned, and the ſervices conſequent upon it. In Britain, it becoming a ſettled principle of tenure, that all lands in the kingdom are holden of the king as their ſovereign and lord paramount, no oath but that of fealty could ever be taken to inferior lords; and the oath of allegiance was neceſſarily confined to the perſon of the king alone. By an eaſy analogy, the term of *allegiance* was ſoon brought to ſignify all other engagements which are due from ſubjects to their prince, as well as thoſe duties which were ſimply and merely territorial. And the oath of allegiance, as adminiſtered in England for upwards of 600 years, contained a promiſe "to be true and faithful to the king and his heirs, and truth and faith to bear of life and limb and terrene honour, and not to

"know

Allegiance "know or hear of any ill or damage intended him, "without defending him therefrom." But, at the revolution, the terms of this oath being thought perhaps to favour too much the notion of non-resistance, the present form was introduced by the convention parliament, which is more general and indeterminate than the former; the subject only promising "that he will "be faithful and bear *true* allegiance to the king," without mentioning "his heirs," or specifying in the least wherein that allegiance consists. The oath of supremacy is principally calculated as a renunciation of the pope's pretended authority: and the oath of abjuration, introduced in the reign of King William, very amply supplies the loose and general texture of the oath of allegiance; it recognizing the right of his majesty, derived under the act of settlement; engaging to support him to the utmost of the juror's power; promising to disclose all traiterous conspiracies against him; and expressly renouncing any claim of the descendants of the late pretender, in as clear and explicit terms as the English language can furnish. This oath must be taken by all persons in any office, trust, or employment; and may be tendered by two justices of the peace to any person whom they shall suspect of disaffection. And the oath of allegiance may be tendered to all persons above the age of twelve years, whether natives, denizens, or aliens.

Blackstone's Comment.

But, besides these *express* engagements, the law also holds that there is an *implied*, *original*, and *virtual* allegiance, owing from every subject to his sovereign, antecedently to any express promise, and although the subject never swore any faith or allegiance in form. Thus Sir Edward Coke very justly observes, that "all subjects are equally bounden to their allegiance as if they had taken the oath; because it is written by the finger of the law in their hearts, and the taking of the corporal oath is but an outward declaration of the same."

Allegiance, both express and implied, is however distinguished by the law into two sorts or species, the one *natural*, the other *local*; the former being also perpetual, the latter temporary.

Natural allegiance is such as is due from all men born within the king's dominions immediately upon their birth. For, immediately upon their birth, they are under the king's protection; at a time too, when (during their infancy) they are incapable of protecting themselves. Natural allegiance is, therefore, a debt of gratitude; which cannot be forfeited, cancelled, or altered, by any change of time, place, or circumstance, nor by any thing but the united concurrence of the legislature. A Briton who removes to France, or to China, owes the same allegiance to the king of Britain there as at home, and twenty years hence as well as now. For it is a principle of universal law, That the natural-born subject of one prince cannot by any act of his own, no, not by swearing allegiance to another, put off or discharge his natural allegiance to the former: for this natural allegiance was intrinsic, and primitive, and antecedent to the other; and cannot be divested without the concurrent act of that prince to whom it was first due.

Local allegiance is such as is due from an alien, or stranger born, for so long time as he continues within the king's dominion and protection; and it ceases the instant such stranger transfers himself from this kingdom to another. Natural allegiance is therefore *perpetual*, and local *temporary* only; and that for this reason, evidently founded upon the nature of government, That allegiance is a debt due from the subject, upon an implied contract with the prince; that so long as the one affords protection, so long the other will demean himself faithfully. Allegory.

The *oath* of allegiance, or rather the *allegiance* itself, is held to be applicable, not only to the political capacity of the king, or regal office, but to his natural person and blood-royal: and for the misapplication of their allegiance, viz. to the regal capacity or crown, exclusive of the person of the king, were the Spencers banished in the reign of Edward II. And from hence arose that principle of personal attachment and affectionate loyalty, which induced our forefathers (and, if occasion required, would doubtless induce their sons) to hazard all that was dear to them, life, fortune, and family, in defence and support of their liege lord and sovereign.

It is to be observed, however, in explanation of this allegiance, That it does not preclude resistance to the king, when his misconduct or weakness is such as to make resistance beneficial to the community. It seems fairly presumable, that the convention parliament, which introduced the oath of allegiance in its present form, did not intend to exclude all resistance; since the very authority by which the members sat together, was itself the effect of a successful opposition to an acknowledged sovereign.

Paley's Moral and Political Philosophy.

Again: The allegiance above described can only be understood to signify obedience to lawful commands. If, therefore, the king should issue a proclamation, levying money or imposing any service or restraint upon the subject, beyond what the law authorised, there would exist no sort of obligation to obey such a proclamation, in consequence of having taken the oath of allegiance.

Neither can allegiance be supposed to extend to the king after he is actually and absolutely deposed, driven into exile, or otherwise rendered incapable of exercising the regal office. The promise of allegiance implies, that the person to whom the promise is made continues king; that is, continues to exercise the power, and afford the protection, which belong to the office of king: for it is the possession of these which makes such a particular person the object of the oath.

ALLEGORY, in composition, consists in choosing a secondary subject, having all its properties and circumstances resembling those of the principal subject, and describing the former in such a manner as to represent the latter. The principal subject is thus kept out of view, and we are left to discover it by reflection. In other words, an allegory is, in every respect, similar to an hieroglyphical painting, excepting only that words are used instead of colours. Their effects are precisely the same: An hieroglyphic raises two images in the mind; one seen, that represents one that is not seen: An allegory does the same; the representative subject is described, and the resemblance leads us to apply the description to the subject represented.

There cannot be a finer or more correct allegory than the following, in which a vineyard is made to represent God's own people the Jews:

"Thou haſt brought a vine out of Egypt; thou "haſt caſt out the heathen, and planted it. Thou didſt "cauſe it to take deep root, and it filled the land. The "hills were covered with its ſhadow, and the boughs "thereof were like the goodly cedars. Why haſt thou "then broken down her hedges, ſo that all that paſs "do pluck her? The boar out of the wood doth waſte "it, and the wild beaſt doth devour it. Return, we "beſeech thee, O God of hoſts: look down from hea-"ven, and behold, and viſit this vine and the vineyard "thy right-hand hath planted, and the branch thou "madeſt ſtrong for thyſelf." Pſal. lxxx.

Nothing gives greater pleaſure than an allegory, when the repreſentative ſubject bears a ſtrong analogy, in all its circumſtances, to that which is repreſented. But moſt writers are unlucky in their choice, the analogy being generally ſo faint and obſcure, as rather to puzzle than to pleaſe. Allegories, as well as metaphors and ſimiles, are unnatural in expreſſing any ſevere paſſion which totally occupies the mind. For this reaſon, the following ſpeech of Macbeth is juſtly condemned by the learned author of the Elements of Criticiſm:

Methought I heard a voice cry, Sleep no more!
Macbeth doth murder Sleep; the innocent ſleep;
Sleep that knits up the ravell'd ſleeve of Care,
The birth of each day's life, ſore Labour's bath,
Balm of hurt minds, great Nature's ſecond courſe,
Chief nouriſher in life's feaſt. Act. ii. Sc. 3.

But ſee this ſubject more fully treated under the article Metaphor *and Allegory*.

ALLEGRI (Antonio), called *Corregio* from the place of his birth, an eminent hiſtorical painter, was born in the year 1494. Being deſcended of poor parents, and educated in an obſcure village, he enjoyed none of thoſe advantages which contributed to form the other great painters of that illuſtrious age. He ſaw none of the ſtatues of ancient Greece or Rome; nor any of the works of the eſtabliſhed ſchools of Rome and Venice. But Nature was his guide; and Corregio was one of her favourite pupils. To expreſs the facility with which he painted, he uſed to ſay that he always had his thoughts ready at the end of his pencil.

The agreeable ſmile, and the profuſion of graces which he gave to his madonas, ſaints, and children, have been taxed with being ſometimes unnatural; but ſtill they are amiable and ſeducing: An eaſy and flowing pencil, an union and harmony of colours, and a perfect intelligence of light and ſhade, give an aſtoniſhing relief to all his pictures, and have been the admiration both of his cotemporaries and his ſucceſſors. Annibal Caracci, who flouriſhed 50 years after him, ſtudied and adopted his manner in preference to that of any other maſter. In a letter to his couſin Louis, he expreſſes with great warmth the impreſſion which was made on him by the firſt ſight of Corregio's paintings: "Every thing which I ſee here (ſays he) aſtoniſhes me; particularly the colouring and the beauty of the children. They live—they breathe—They ſmile with ſo much grace and ſo much reality, that it is impoſſible to refrain from ſmiling and partaking of their enjoyment. My heart is ready to break with grief when I think on the unhappy fate of poor Corregio—that ſo wonderful a man (if he ought not rather to be called an angel) ſhould finiſh his days ſo miſerably, in a country where his talents were never known!"——

From want of curioſity or of reſolution, or from want of patronage, Corregio never viſited Rome, but remained his whole life at Parma, where the art of painting was little eſteemed, and of conſequence poorly rewarded. This concurrence of unfavourable circumſtances occaſioned at laſt his premature death at the age of 40. He was employed to paint the cupola of the cathedral at Parma, the ſubject of which is an aſſumption of the Virgin; and having executed it in a manner that has long been the admiration of every perſon of good taſte, for the grandeur of deſign, and eſpecially for the boldneſs of the fore-ſhortenings (an art which he firſt and at once brought to the utmoſt perfection), he went to receive his payment. The canons of the church, either through ignorance or baſeneſs, found fault with his work; and although the price originally agreed upon had been very moderate, they alleged that it was far above the merit of the artiſt, and forced him to accept of the paultry ſum of 200 livres; which, to add to the indignity, they paid him in copper money. To carry home this unworthy load to his indigent wife and children, poor Corregio had to travel ſix or eight miles from Parma. The weight of his burden, the heat of the weather, and his chagrin at this villanous treatment, immediately threw him into a pleuriſy, which in three days put an end to his life and his misfortunes.

For the preſervation of this magnificent work the world is indebted to Titian. As he paſſed through Parma, in the *ſuite* of Charles V. he run inſtantly to ſee the *chef d'œuvre* of Corregio. While he was attentively viewing it, one of the principal canons of the church told him that ſuch a groteſque performance did not merit his notice, and that they intended ſoon to have the whole defaced. "Have a care of what you do (replied the other), if I were not Titian, I would certainly wiſh to be Corregio."

Corregio's exclamation upon viewing a picture by Raphael is well known. Having long been accuſtomed to hear the moſt unbounded applauſe beſtowed on the works of that divine painter, he by degrees became leſs deſirous than afraid of ſeeing any of them. One, however, he at laſt had occaſion to ſee. He examined it attentively for ſome minutes in profound ſilence; and then with an air of ſatisfaction exclaimed, *I am ſtill a painter*. Julio Romano, on ſeeing ſome of Corregio's pictures at Parma, declared they were ſuperior to any thing in painting he had yet beheld. One of theſe no doubt would be the famous Virgin and Child, with Mary Magdalene and St Jerom: But whether our readers are to depend upon his opinion, or upon that of Lady Millar, who in her *Letters from Italy* gives a very unfavourable account of it, we ſhall not preſume to determine. This lady, however, ſpeaks in a very different ſtyle of the no leſs famous *Notte* or Night of Corregio, of which ſhe ſaw only a copy in the Duke's palace at Modena, the original having been ſold for a great ſum of money to the king of Poland. "It ſurpriſes me very much (ſays ſhe), to ſee how different the characters are in this picture from that which I already have deſcribed to you. The ſubject is a Nativity; and the extraordinary beauty of this picture proceeds from the *clair*

obſcure

obscure: there are two different lights introduced, by means of which the personages are visible; namely, the light proceeding from the body of the child, and the moon-light. These two are preserved distinct, and produce a most wonderful effect. The child's body is so luminous, that the superficies is nearly transparent, and the rays of light emitted by it are verified in the effect they produce upon the surrounding objects. They are not rays distinct and separate, like those round the face of a sun that indicates an insurance-office; nor linear, like those proceeding from the man in the almanack; but of a dazzling brightness: by their light you see clearly the face, neck, and hands, of the Virgin (the rest of the person being in strong shadow), the faces of the *pastori* who crowd round the child, and particularly one woman, who holds her hand before her face, lest her eyes should be so dazzled as to prevent her from beholding the Infant. This is a beautiful natural action, and is most ingeniously introduced. The straw on which the child is laid appears gilt, from the light of his body shining on it. The moon lights up the back-ground of the picture, which represents a landscape. Every object is distinct, as in a bright moon-light night; and there cannot be two lights in nature more different than those which appear in the same picture. The virgin and the child are of the most perfect beauty. There is a great variety of character in the different persons present, yet that uniformity common to all herdsmen and peasants. In short, this copy is so admirable, that I was quite sorry to be obliged to lose sight of it so soon; but I never shall forget it. The duke of Modena, for whom Corregio did the original picture, gave him only 600 livres of France for it; a great sum in those days: but at present, what ought it to cost?" This great painter's death happened in 1534.

ALLEGRO, in music, an Italian word, denoting that the part is to be played in a sprightly, brisk, lively, and gay manner.

Piu ALLEGRO, signifies, that the part it is joined to should be sung or played quicker; as

Poco piu ALLEGRO intimates, that the part to which it refers ought to be played or sung only a little more briskly than allegro alone requires.

ALLEIN (Joseph), the son of Tobias Allein, was born in the Devizes, in Wiltshire, in 1633, and educated at Oxford. In 1655, he became assistant to Mr Newton, in Taunton-Magdalen, in Somersetshire; but was deprived for non-conformity. He died in 1668, aged 35. He was a man of great learning, and greater charity; preserving, though a nonconformist and a severe sufferer on that account, great respect for the church, and loyalty to his sovereign. He wrote several books of piety, which are highly esteemed; but his *Alarm to unconverted sinners* is more famous than the rest. There have been many editions of this little pious work, the sale of which has been very great; of the edition 1672, there were 20,000 sold; of that of 1675, with this title, *A sure guide to heaven*, 50,000. There was also a large impression of it with its first title, in 1720.

ALLELUIAH, or HALLELUIAH, a word signifying, *praise the Lord*, to be met with either at the beginning or end of some psalms: such is psalm cxlv. and those that follow, to the end. Alleluiah was sung upon solemn days of rejoicings, Tobit xiii. 12. St John in the Revelations (xix. 1, 3, 4, 6.) says, that he "heard a great voice of much people in heaven, who said, Alleluiah; and the four and twenty elders, and the four beasts, fell down and worshipped God that sat on the throne, saying *Alleluiah*." This hymn of joy and praises was transferred from the synagogue to the church. St Jerom tells us, that at the funeral of Fabiola several psalms were sung with loud alleluiahs; and that the monks of Palestine were awakened, at their midnight watchings, with the singing of alleluiahs. So much energy has been observed in this term, that the ancient church thought proper to preserve it, without translating it either into Greek or Latin, for fear of impairing the genius and softness of it. The fourth council of Toledo has prohibited the use of it in times of Lent, or other days of fasting, and in the ceremonies of mourning: and, according to the present practice of the Romish church, this word is never repeated in Lent, nor in the obsequies of the dead; notwithstanding which, it is used in the mass for the dead, according to the mosarabic ritual, at the introit, when they sing, *Tu es portio mea, Domine, Alleluia, in terra viventium, Alleluia, Alleluia*. The singing alleluiah was oftentimes an invitatory or call to each other to praise the Lord.

ALLEMAND, a sort of grave solemn music, with good measure, and a slow movement.—It is also a brisk kind of dance, very common in Germany and Switzerland.

ALLEMANNIC, in a general sense, denotes any thing belonging to the ancient Germans. Thus, we meet with Allemannic history, Allemannic language, Allemannic law, &c.

ALLEN (John) archbishop of Dublin in the reign of king Henry VIII. was educated in the university of Oxford; from whence removing to Cambridge, he there took the degree of bachelor of laws. He was sent by Dr Warham, archbishop of Canterbury, to the pope, about certain matters relating to the church. He continued at Rome nine years, and was created doctor of laws; either there or in some other university of Italy. After his return, he was appointed chaplain to Cardinal Wolsey, and was commissary or judge of his court as legate *à latere*; in the execution of which office he was suspected of great dishonesty, and even perjury. He assisted the cardinal in visiting, and afterwards suppressing, 40 of the smaller monasteries, for the erection of his college at Oxford and that at Ipswich. The cardinal procured for him the living of Dalby in Leicestershire, though it belonged to the master and brethren of the hospital of Burton Lazars. About the latter end of the year 1525 he was incorporated doctor of laws in the university of Oxford. On the 13th of March 1528 he was consecrated archbishop of Dublin, in the room of Dr Hugh Inge deceased; and about the same time was made chancellor of Ireland. He wrote, 1. *Epistola de Pallii significatione activa et passiva;* penned by him at the time when he received the archiepiscopal pall. 2. *De consuetudinibus ac statutis in tuitoriis causis observandis.* He wrote also several other pieces relating to the church. His death, which happened in July 1534, was very tragical: for being taken in a time of rebellion by Thomas Fitzgerald, eldest son to the earl of Kildare, he was by his command most cruelly murdered, being

brained like an ox, at Tartaine in Ireland, in the 58th year of his age. The place where the murder was committed was afterwards hedged in, overgrown, and unfrequented, in deteſtation of the fact.

Allen (Thomas), a famous mathematician of the 16th century, born at Utoxeter in Staffordſhire the 21ſt of December 1542. He was admitted ſcholar of Trinity-college Oxford the 4th of June 1561; and in 1567 took his degree of maſter of arts. In 1570 he quitted his college and fellowſhip and retired to Glouceſter-hall; where he ſtudied very cloſely, and became famous for his knowledge in antiquity, philoſophy, and mathematics. Having received an invitation from Henry earl of Northumberland, a great friend and patron of the mathematicians, he ſpent ſome time at the earl's houſe, where he became acquainted with thoſe celebrated mathematicians Thomas Harriot, John Dee, Walter Warner, and Nathaniel Torporley. Robert earl of Leiceſter had a particular eſteem for Mr Allen, and would have conferred a biſhopric upon him, but his love of ſolitude and retirement made him decline the offer. His great ſkill in the mathematics made the ignorant and vulgar look upon him as a magician or conjurer: the author of a book intitled *Leiceſter's Commonwealth*, has accordingly accuſed him with uſing the art of figuring, to procure the earl of Leiceſter's unlawful deſigns, and endeavouring by the black art to bring about a match betwixt him and Queen Elizabeth. But without pretending to point out the abſurdity of the charge, it is certain that the earl placed ſuch confidence in Allen, that nothing material in the ſtate was tranſacted without his knowledge; and the earl had conſtant information, by letter, from Mr Allen, of what paſſed in the univerſity. Mr Allen was very curious and indefatigable in collecting ſcattered manuſcripts relating to hiſtory, antiquity, aſtronomy, philoſophy, and mathematics: theſe collections have been quoted by ſeveral learned authors, &c. and mentioned to have been in the Bibliotheca Alleniana. He publiſhed in Latin the ſecond and third books of Claudius Ptolemy of Peluſium, *Concerning the Judgment of the Stars*, or, as it is commonly called, of the *Quadripartite Conſtruction*, with an expoſition. He wrote alſo notes on many of Lilly's books, and ſome on John Bale's work *De Scriptoribus M. Britanniæ*. Having lived to a great age, he died at Glouceſter-hall on the 30th of September 1632.

ALLENDORF, a ſmall town in the circle of the Upper Rhine, and in the landgravate of Heſſe-Caſſel, remarkable for its ſalt-works and three ſtone-bridges. It is ſeated on the river Weſer, 15 miles eaſt of Caſſel; E. Long. 10. 5. N. Lat. 51. 26.

ALLER, a river which runs through the duchy of Lunenburg, and falls into the Weſer a little below Verden.

Aller, *good*, in our ancient writers. The word *aller* ſerves to make the expreſſion of ſuperlative ſignification. So, *aller-good* is the greateſt good. Sometimes it is written *alder*.

ALLERION, or Alerion, in heraldry, a ſort of eagle without beak or feet, having nothing perfect but the wings. They differ from martlets by having their wings expanded, whereas thoſe of the martlet are cloſe; and denote imperialiſts vanquiſhed and diſarmed; for which reaſon they are more common in French than in German coats of arms.

ALLESTRY (Richard, D.D.) an eminent divine, born at Uppington in Shropſhire in March 1619, was educated in the grammar-ſchool at Coventry, and afterwards at Chriſt-church in Oxford. His parts, which were extraordinary, were improved by a no leſs extraordinary induſtry. He took up arms for king Charles I. and was ſometimes ſeen with his muſket in one hand and his book in the other. He was very active in the ſervice of king Charles II. before his reſtoration, and was employed by the royaliſts in tranſacting buſineſs with that prince during his exile; but was at laſt ſeized at Dover by a party of ſoldiers, and committed priſoner to Lambeth-houſe, where he was confined ſix or eight weeks: but ſoon after the reſtoration he was made canon of Chriſt-church, created doctor of divinity, and appointed chaplain in ordinary to the king, and regius profeſſor of divinity. In 1665 he was appointed provoſt of Eton college, where he raiſed the ſchool, which he found in a low condition, to an uncommon pitch of reputation. The weſt ſide of the outward quadrangle of that college was built from the ground at his expence. The excellent Dr Hammond, who was his intimate friend, left him his valuable library, which he himſelf afterwards bequeathed to his ſucceſſors in the divinity-chair. He was eminent for his piety, benevolence, and integrity; for the ſincerity of his friendſhip, and his diſintereſted temper. He wrote ſeveral books; and a collection of his ſermons were printed after his deceaſe by Dr Fell biſhop of Oxford. He died Auguſt 28. 1680.

Allestry (Jacob), an Engliſh poet of the laſt century. He was the ſon of James Alleſtry, a bookſeller of London who was ruined by the great fire in 1666. Jacob was educated at Weſtminſter ſchool, entered at Chriſt-church Oxford in the act-term 1671 at the age of 18, and was elected ſtudent in 1672. He took the degree in arts; was muſic-reader in 1679, and terræ filius in 1681; both which offices he executed with great applauſe, being eſteemed a good philologiſt and poet. He had a chief hand in the verſes and paſtorals ſpoken in the theatre at Oxford May 21. 1681, by Mr William Savile ſecond ſon of the marquis of Halifax, and George Cholmondeley ſecond ſon of Robert viſcount Kells (both of Chriſt-church), before James duke of York, his ducheſs, and the lady Anne; which verſes and paſtorals were afterwards printed in the "Examen Poeticum." He died October 15. 1686, and was buried in St Thomas's church-yard.

ALLEVEURE, a ſmall braſs Swediſh coin, worth about ½d. Engliſh money.

ALLEVIATION, denotes the making a thing lighter, and eaſier to bear or endure. It ſtands oppoſed to *aggravation*.

ALLEY (William), biſhop of Exeter in the reign of queen Elizabeth, was born at Great Wycomb in Buckinghamſhire. From Eton ſchool, in the year 1528, he removed to king's college Cambridge, where he took the degree of bachelor of arts. He alſo ſtudied ſome time at Oxford; afterwards he married, was preſented to a living, and became a zealous reformer. Upon queen Mary's acceſſion he left his cure and retired into the north of England; where he maintained his wife and himſelf by teaching a ſchool, and practiſing phyſic. Queen Elizabeth aſcending the throne, he went to London, where he acquired great reputation by reading the divinity-lecture at St Paul's, and

in July 1560 was consecrated bishop of Exeter. He was created doctor of divinity at Oxford in November 1561. He died on the 15th of April 1570, and was buried at Exeter in the cathedral. He wrote, 1. *The poor man's library*, 2 vol. fol. Lond. 1571. These volumes contain twelve lectures on the first epistle of St Peter, read at St Paul's. 2. *A Hebrew grammar*. Whether it was ever published is uncertain. He translated the Pentateuch, in the version of the Bible which was undertaken by queen Elizabeth's command.

Alley, in gardening, a straight parallel walk, bounded on both sides with trees, shrubs, &c. and usually covered with gravel or turf.

Alley, among builders, denotes a narrow passage leading from one place to another.

Alley, in perspective, that which, in order to have a greater appearance of length, is made wider at the entrance than at the termination.

Alley, in the new husbandry, implies the vacant space between the outermost row of corn on one bed and the nearest row to it on the next parallel bed; and it is usually about four feet in breadth, exclusive of the partitions between the rows of corn in the beds. The first hoeing of wheat is performed in the beginning of winter, and the earth is ploughed away from the rows into the intervals, which forms small ridges in the middle between the double rows. The second hoeing is in the spring, which turns it back to the rows, leaving a furrow in the middle of the alley. The third hoeing is from the rows, after the wheat has blossomed; this turns the earth into the intervals, forming small ridges there, as at the first hoeing. The fourth hoeing returns the earth to the ridges, which is performed a month or more after the third hoeing. This commonly finishes the horse-hoeings, if the land is in good heart; otherwise one or two more hoeings are necessary.

ALLEYN (Edward), a celebrated English actor in the reigns of queen Elizabeth and king James, and founder of the college at Dulwich in Surry, was born at London, in the parish of St Botolph, Sept. 1. 1566, as appears from a memorandum of his own writing. Dr Fuller says, that he was bred a stage-player; and that his father would have given him a liberal education, but that he was not turned for a serious course of life. He was, however, a youth of an excellent capacity, a cheerful temper, a tenacious memory, a sweet elocution, and in his person of a stately port and aspect; all which advantages might well induce a young man to take to the theatrical profession. By several authorities we find he must have been on the stage some time before 1592; for at this time he was in high favour with the town, and greatly applauded by the best judges, particularly by Ben Johnson.

Haywood, in his prologue to Marloe's Jew of Malta, calls him Proteus for shapes, and Roscius for a tongue. He usually played the capital parts, and was one of the original actors in Shakespeare's plays; in some of Ben Johnson's he was also a principal performer: but what characters he personated in either of these poets, it is difficult now to determine. This is owing to the inaccuracy of their editors, who did not print the names of the players opposite to the characters they performed, as the modern custom is; but gave one general list of actors to the whole set of plays, as in the old folio edition of Shakespeare; or divided one from the other, setting the dramatis personæ before the plays, and the catalogue of performers after them, as in Johnson's.

It may appear surprising how one of Mr Alleyn's profession should be enabled to erect such an edifice as Dulwich College, and liberally endow it for the maintenance of so many persons. But it must be observed that he had some paternal fortune, which, though small, might lay a foundation for his future affluence; and it is to be presumed, that the profits he received from acting, to one of his provident and managing disposition, and one who by his excellence in playing drew after him such crowds of spectators, must have considerably improved his fortune: besides, he was not only an actor, but master of a playhouse, built at his own expence, by which he is said to have amassed considerable wealth. He was also keeper of the king's wild beasts, or master of the royal bear-garden, which was frequented by vast crowds of spectators; and the profits arising from these sports are said to have amounted to 500l. per annum. He was thrice married; and the portions of his two first wives, they leaving him no issue to inherit, might probably contribute to this benefaction. Such kind of donations have been frequently thought to proceed more from vanity and ostentation than real piety; but this of Mr Alleyn has been ascribed to a very singular cause, for the devil has been said to be the first promoter of it. Mr Aubrey mentions a tradition, "that Mr Alleyn playing a demon with six others, in one of Shakespear's plays, was, in the midst of the play, surprised by an apparition of the devil; which so worked on his fancy, that he made a vow, which he performed by building Dulwich College." He began the foundation of this college, under the direction of Inigo Jones, in 1614; and the buildings, gardens, &c. were finished in 1617, in which he is said to have expended about 10,000l. After the college was built, he met with some difficulty in obtaining a charter for settling his lands in mortmain: for he proposed to endow it with 800l. per annum, for the maintenance of one master, one warden, and four fellows, three whereof were to be clergymen, and the fourth a skilful organist; also six poor men and as many women, besides twelve poor boys to be educated till the age of fourteen or sixteen, and then put out to some trade or calling. The obstruction he met with arose from the lord chancellor Bacon, who wished king James to settle part of those lands for the support of two academical lectures; and he wrote a letter to the Marquis of Buckingham, dated August 18. 1618, intreating him to use his interest with his Majesty for that purpose. Mr Alleyn's solicitation was however at last complied with, and he obtained the royal licence, giving him full power to lay his foundation, by his Majesty's letter-patent, bearing date the 21st of June, 1619; by virtue whereof he did, in the chapel of the said new hospital at Dulwich, called "The College of God's Gift," on the 13th of September following, publicly read and published a quadripartite writing in parchment, whereby he created and established the said college; he then subscribed it with his name, and fixed his seal to several parts thereof, in presence of several honourable persons, and ordered copies of the writings to four different

different parifhes. He was himfelf the firft mafter of his college; fo that to make ufe of the words of Mr Haywood, one of his contemporaries, "He was fo "mingled with humility and charity, that he became "his own penfioner, humbly fubmitting himfelf to "that proportion of diet and clothes which he had "beftowed on others." We have no reafon to think he ever repented of this diftribution of his fubftance; but on the contrary, that he was entirely fatisfied, as appears from the following memorial in his own writing, found amongft his papers: "May 26, 1620—"My wife and I acknowledged the fine at the com-"mon pleas bar, of all our lands to the college: blef-"fed be God that he has given us life to do it." His wife died in the year 1623; and about two years afterwards he married Conftance Kinchtoe, who furvived him, and received remarkable proofs of his affection, if at leaft we may judge of it by his will, wherein he left her confiderably. He died Nov. 25. 1626, in the 61ft year of his age, and was buried in the chapel of his new college, where there is a tomb-ftone over his grave, with an infcription. His original Diary is alfo there preferved.

The fubjoined anecdote is entertaining in itfelf, and fhows the high efteem in which Mr Alleyn was held as an actor: 'Edward Alleyn, the Garrick of Shake-'fpear's time, had been on the moft friendly footing 'with our poet, as well as Ben Johnfon. They ufed 'frequently to fpend their evenings together at the 'fign of the Globe, fomewhere near Black Friars, 'where the playhoufe then was. The world need not 'be told, that the convivial hours of fuch a triumvi-'rate muft be pleafing as well as profitable, and may 'truly be faid to be fuch pleafures as might bear the 'reflections of the morning. In confequence of one 'of thefe meetings, the following letter was written by 'G. Peel, a Fellow of Chrift-church college, Oxford, 'and a dramatic poet, who belonged to the Club, to 'one Marle, an intimate of his:

"Friend Marle,

"I muft defyr that my fyfter hyr watch, and the "cookerie book you promyfed, may be fente bye the "man.——I never longed for thy company more than "laft night: we were all very merrye at the Globe, "when Ned Alleyn did not fcruple to affyrme plea-"fauntely to thy Friende Will, that he had ftolen his "fpeech about the Qualityes of an actor's excellencye "in Hamlet hys Tragedye, from converfations many-"fold whych had paffed betweene them, and opinyons "given by Alleyn touchinge the fubjecte.——Shake-"fpeare did not take this talke in good forte; but "Johnfon put an end to the ftrife with wittylye re-"markinge, *This affaire needeth no Contentione; you* "*ftole it from Ned, no doubte; do not marvel: Have* "*you not feen him act tymes out of number?*—Believe "me moft fyncerilie, yours, *G. Peele.*"

ALLIA, a river of Italy, which running down a very fteep channel from the mountains of Cruftuminum, mixes with the Tiber at 40 miles from Rome; famous for the great flaughter of the Romans by the Gauls, under Brennus; hence *Allienfis dies*, an unlucky day, (Virgil, Ovid, Lucan.) Our anceftors, fays Cicero, deemed the day of the fight of *Allia* more fatal than that of taking the city.

ALLIANCE, in the civil and canon law, the relation contracted between two perfons or two families by marriage.

ALLIANCE is alfo ufed for a treaty entered into by fovereign princes and ftates, for their mutual fafety and defence.—In this fenfe, alliances may be diftinguifhed into fuch as are offenfive, whereby the contracting parties oblige themfelves jointly to attack fome other power; and into defenfive ones, whereby they bind themfelves to ftand by and defend each other in cafe they are attacked by others.—Alliance, with the ancient Romans, though a fort of fervitude, was much coveted. Ariarathes, we are told by Polybius, offered a facrifice to the gods by way of thankfgiving for having obtained this alliance. The reafon was, that thenceforwards people were fure not to receive any injuries except from them.—There were different forts of allies: fome only united to them by a participation of the privileges of Romans, as the Latini and Hernici; others by their very foundation, as the colonies; others by the benefactions they received from them, as Mafiniffa, Eumenes, and Attalus, who owed their kingdoms to Rome; others by free treaties, which laft by a long alliance became fubjects, as the kings of Bithynia, Cappadocia, Egypt, and moft of the cities of Greece: laftly, others by compulfive treaties, and the law of fubjection, as Philip and Antiochus. For they never granted peace to an enemy, without making an alliance with him; that is, they never fubdued any people without ufing it as a means of fubduing others.

The forms or ceremonies of alliances have been various in different ages and countries. Among us, figning and fwearing, fometimes at the altar, are the chief; anciently eating and drinking together, chiefly offering facrifices together, were the cuftomary rite of ratifying an alliance. Among the Jews and Chaldeans, heifers or calves; among the Greeks, bulls or goats; and among the Romans, hogs were facrificed on this occafion. Among the ancient Arabs, alliances were confirmed by drawing blood out of the palms of the hands of the two contracting princes with a fharp ftone, dipping herein a piece of their garments, and therewith fmearing feven ftones, at the fame time invoking the gods Vrotalt and Alilat, *i. e.* according to Herodotus, Bacchus and Urania. Among the people of Cholchis, the confirmation of alliances is faid to be effected by one of the princes offering his wife's breafts to the other to fuck, which he was obliged to do till there iffued blood.

ALLIANCE, in a figurative fenfe, is applied to any kind of union or connection; thus we fay, there is an alliance between the church and ftate.

ALLIGATI, in Roman antiquity, the bafeft kind of flaves, who were ufually kept fettered. The Romans had three degrees, or orders, of flaves or fervants; the firft employed in the management of their eftates; the fecond in the menial or lower functions of the family; the third called *alligati*, above mentioned.

ALLIGATION, the name of a method of folving all queftions that relate to the mixture of one ingredient with another. Though writers on arithmetic generally make alligation a branch of that fcience; yet, as it is plainly nothing more than an application of the common properties of numbers, in order to folve a few queftions that occur in particular branches of bufinefs,

we chooſe rather to keep it diſtinct from the ſcience of arithmetic.

Alligation is generally divided into *medial* or *alternate.*

Alligation Medial, from the rates and quantities of the ſimples given, diſcovers the rate of the mixture.

Rule. As the total quantity of the ſimples,
To their price or value;
So any quantity of the mixture,
To the rate.

Examp. A grocer mixeth 30 lb. of currants, at 4d. per lb. with 10 lb. of other currants, at 6d. per lb.: What is the value of 1 lb. of the mixture? *Anſ.* $4\frac{1}{2}$ d.

lb.	*d.*	*d.*
30, at 4	amounts to	120
10, at 6	———	60
40		180

lb. *d.* *lb.* *d.*
If $40 : 180 :: 1 : 4\frac{1}{2}$

Note 1. When the quantity of each ſimple is the ſame, the rate of the mixture is readily found by adding the rates of the ſimples, and dividing their ſum by the number of ſimples. Thus,

Suppoſe a grocer mixes ſeveral ſorts of ſugar, and of each an equal quantity, viz. at 50 s. at 54 s. and at 60 s. per cwt. the rate of the mixture will be 54 s. 8d. per cwt.; for

$$50+54+60=164, \text{ and } 3)\overset{s.}{164})\overset{s.}{54}\ \overset{d.}{8}$$

Note 2. If it be required to increaſe or diminiſh the quantity of the mixture, ſay, As the ſum of the given quantities of the ſimples, to the ſeveral quantities given; ſo the quantity of the mixture propoſed, to the quantities of the ſimples ſought.

Note 3. If it be required to know how much of each ſimple is an aſſigned portion of the mixture, ſay, As the quantity of the mixture, to the ſeveral quantities of the ſimples given; ſo the quantity of the aſſigned portion, to the quantities of the ſimples ſought. Thus,

Suppoſe a grocer mixes 10 lb. of raiſins with 30 lb. of almonds and 40 lb. of currants, and it be demanded, how many ounces of each ſort are found in every pound or in every 16 ounces of the mixture, ſay,

				Oz.	
80 :	10 ::	16 :	2	raiſins.
80 :	30 ::	16 :	6	almonds.
80 :	40 ::	16 :	8	currants.
		Proof	16	

Note 4. If the rates of two ſimples, with the total value and total quantity of the mixture, be given, the quantity of each ſimple may be found as follows, viz. Multiply the leſſer rate into the total quantity, ſubtract the product from the total value, and the remainder will be equal to the product of the exceſs of the higher rate above the lower, multiplied into the quantity of the higher-priced ſimple; and conſequently the ſaid remainder, divided by the difference of the rates, will quote the ſaid quantity. Thus,

Suppoſe a grocer has a mixture of 400 lb. weight, that coſt him 7l. 10s. conſiſting of raiſins at 4d. per lb. and almonds at 6d. how many pounds of almonds were in the mixture?

L. *s.* *d.*	*lb.*	*Rates.*		
	400	6 d.		
	4	4 d.		
7 10 = 1800	——	——		
1600	1600 d.	2d.		
			L.	*s.*
2)200(100 lb. of almonds at 6 d. is			2	10
And 300 lb. of raiſins at 4d. is			5	0
Total 400		Proof	7	10

Alligation Alternate, being the converſe of alligation medial, from the rates of the ſimples, and rate of the mixture given, finds the quantities of the ſimples.

Rules. I. Place the rate of the mixture on the left ſide of a brace, as the root; and on the right ſide of the brace ſet the rates of the ſeveral ſimples, under one another, as the branches. II. Link or alligate the branches, ſo as one greater and another leſs than the root may be linked or yoked together. III. Set the difference betwixt the root and the ſeveral branches right againſt their reſpective yoke-fellows. Theſe alternate differences are the quantities required. Note, 1. If any branch happen to have two or more yoke-fellows, the difference betwixt the root and theſe yoke-fellows muſt be placed right againſt the ſaid branch, one after another, and added into one ſum. 2. In ſome queſtions, the branches may be alligated more ways than one; and a queſtion will always admit of ſo many anſwers as there are different ways of linking the branches.

Alligation alternate admits of three varieties, viz. 1. The queſtion may be unlimited, with reſpect both to the quantity of the ſimples and that of the mixture. 2. The queſtion may be limited to a certain quantity of one or more of the ſimples. 3. The queſtion may be limited to a certain quantity of the mixture.

Variety I. When the queſtion is unlimited, with reſpect both to the quantity of the ſimples and that of the mixture, this is called *Alligation Simple.*

Examp. A grocer would mix ſugars, at 5 d. 7 d. and 10d. per lb. ſo as to ſell the mixture or compound at 8d. per lb.: What quantity of each muſt he take?

$$8\left\{\begin{array}{l}5\\7\\10\end{array}\right. \begin{array}{l}2\\2\\3,1\end{array}\ \left|\ \begin{array}{l}\textit{lb.}\\2\\2\\4\end{array}\right.$$

Here the rate of the mixture 8 is placed on the left ſide of the brace, as the root; and on the right ſide of the ſame brace are ſet the rates of the ſeveral ſimples, viz. 5. 7, 10, under one another, as the branches; according to Rule I.

The branch 10 being greater than the root, is alligated or linked with 7 and 5, both theſe being leſs than the root; as directed in Rule II.

The difference between the root 8 and the branch 5, viz. 3, is ſet right againſt this branch's yoke-fellow 10. The difference between 8 and 7 is likewiſe ſet right againſt the yoke-fellow 10. And the difference betwixt 8 and 10, viz. 2, is ſet right againſt the two yoke-fellows 7 and 5; as preſcribed by Rule III.

As the branch 10 has two differences on the right, viz.

Alligation.

viz. 3 and 1, they are added; and the anſwer to the queſtion is, that 2 lb. at 5d. 2 lb. at 7d. and 4 lb. at 10d. will make the mixture required.

The truth and reaſon of the rules will appear by conſidering, that whatever is loſt upon any one branch is gained upon its yoke-fellow. Thus, in the above example, by ſelling 4 lb. of 10 d. ſugar at 8 d. per lb. there is 8 d. loſt: but the like ſum is gained upon its two yoke-fellows; for by ſelling 2 lb. of 5 d. ſugar at 8d. per lb. there is 6d. gained; and by ſelling 2 lb. of 7d. ſugar at 8d. there is 2d. gained; and 6d. and 2d. make 8d.

Hence it follows, that the rate of the mixture muſt always be mean or middle with reſpect to the rates of the ſimples; that is, it muſt be leſs than the greateſt, and greater than the leaſt; otherwiſe a ſolution would be impoſſible. And the price of the total quantity mixed, computed at the rate of the mixture, will always be equal to the ſum of the prices of the ſeveral quantities caſt up at the reſpective rates of the ſimples.

Variety II. When the queſtion is limited to a certain quantity of one or more of the ſimples, this is called *Alligation Partial*.

If the quantity of one of the ſimples only be limited, alligate the branches, and take their differences, as if there had been no ſuch limitation; and then work by the following proportion:

As the difference right againſt the rate of the ſimple whoſe quantity is given,
To the other differences reſpectively;
So the quantity given,
To the ſeveral quantities ſought.

Examp. A diſtiller would, with 40 gallons of brandy at 12s. per gallon, mix rum at 7s. per gallon, and gin at 4s. per gallon: How much of the rum and gin muſt he take, to ſell the mixture at 8s. per gallon?

				Gal.	
8	12	1 4,	5	40 of brandy.	*Anſ.*
	7	4	4	32 of rum.	
	4	4	4	32 of gin.	

The operation gives for anſwer, 5 gallons of brandy, 4 of rum, and 4 of gin. But the queſtion limits the quantity of brandy to 40 gallons; therefore ſay,

If 5 : 4 : : 40 : 32

The quantity of gin, by the operation, being alſo 4, the proportion needs not be repeated.

Variety III. When the queſtion is limited to a certain quantity of the mixture, this is called *Alligation Total*.

After linking the branches, and taking the differences, work by the proportion following:

As the ſum of the differences,
To each particular difference;
So the given total of the mixture,
To the reſpective quantities required.

Examp. A vintner hath wine at 3s. per gallon, and would mix it with water, ſo as to make a compoſition of 144 gallons, worth 2s. 6d. per gallon: How much wine, and how much water, muſt he take?

			Gal.	
30	36	30	120 of wine.	*Anſw.*
	0	6	24 of water.	
		36	144 total.	

120 × 36 = 4320
24 × 0 = 0

Proof 144)4320(30
As 36 : 30 : : 144 : 120
As 36 : 6 : : 144 : 24.

There being here only two ſimples, and the total of the mixture limited, the queſtion admits but of one anſwer.

Alligator || Alliteration.

ALLIGATOR, in zoology, a ſynonyme of the lacerta crocodilus. See Lacerta.

Alligator Pear. See Laurus.

ALLIONIA, in botany, a genus of the monogynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking under the 48th order, *Aggregatæ*. The characters are: The common *calyx* is oblong, ſimple, three-flowered, five-parted, and perſiſtent; the proper one, obſcure, above: The proper *corolla* is monopetalous and funnel-ſhaped; the mouth quinquefid and erect: The *ſtamina* conſiſt of four briſtly filaments, longer than the corolla, and bending to one ſide; the antheræ are roundiſh: The *piſtillum* has an oblong germen beneath; the *ſtylus* is briſtly, and longer than the ſtamina; the ſtigmata are multifid and linear: There is no *pericarpium*: The *ſeeds* are ſolitary, oblong, and naked: The *receptaculum* is naked. There are two ſpecies, the violeacea and incarnata, both natives of America.

ALLIOTH, a ſtar in the tail of the greater bear, much uſed for finding the latitude at ſea.

ALLITERATION, an ornament of language chiefly uſed in poetry, and conſiſting in the repetition of the ſame letter at certain intervals. We do not remember to have ever ſeen any ſatisfactory account of alliteration in the writings of the critics. They ſeem to have paſſed it over in contemptuous ſilence; either as a falſe refinement or as a mere trifle. It perhaps deſerves a better fate. Many chapters have been compoſed on quantity, on the expreſſion reſulting from different arrangements of long and ſhort ſyllables, and on the powers of pauſes as they are variouſly placed, without a word of alliteration. This is the more extraordinary, as one ſhould think it impoſſible for any man to examine minutely, and, as it were, diſſect a number of verſes, without perceiving the vaſt abundance of this ornament. It is as if an anatomiſt ſhould publiſh a complete table of the arteries in the human body, and affect never to have ſeen a vein nor a nerve: for it may be affirmed, with ſmall danger of miſtake, that if you examine any number of verſes, remarkable either for ſweetneſs or for energy, they will be found in ſome degree alliterative. We do not pretend to ſay, that the ſweetneſs and energy of verſification depends chiefly on this circumſtance, yet we cannot help believing that it may claim ſome ſhare: for it is a conſtant appearance, as far as we have ever obſerved, that the poets whoſe fame is higheſt for verſification, are moſt extenſive dealers in this article.

The trifling poor appearance of the ornament itſelf, upon

Alliteration.

upon a ſuperficial view, and the frequent abuſe of it, are circumſtances indeed which give no encouragement to a ſerious inquiry into its nature and operation. How common is it for writers, who affect to be comic, when in want of other means for raiſing a ſmile, to uſe affected alliteration with ſucceſs. But, in the fine arts, no beauty nor grace is beyond the power of ridicule. The nobleſt attitudes in painting have been rendered laughable by caricatura. St Paul preaching at Athens, in the deſign of Raphael, appears elegant, noble, and in ſome degree awful. The ſame apoſtle, repreſented by Hogarth in nearly the ſame attitude, pleading before the governor Felix, ſeems altogether ridiculous. So the language and verſification of Milton in the Paradiſe Loſt appear only proper for the moſt elevated ſubjects. In the Splendid Shilling of Philips, they appear equally proper for the loweſt. So fares it alſo with alliteration. Nor ought we to be mortified at the diſcovery, that much of the delight afforded by verſification ariſes from a cauſe ſo pitiful as the repetition of the ſame letter twice, or oftener, on the accented parts of a verſe; for there are many other cauſes of pleaſure, which, when thus detected and taken to pieces, ſeem equally contemptible.

We apprehend the principal operation of this ornament to be quite mechanical. It is eaſier for the organs of ſpeech to reſume, at ſhort intervals, one certain conformation, than to throw themſelves into a number of different ones, unconnected and diſcordant. For example, a ſucceſſion of labials, interſperſed at regular diſtances with dentals and gutturals, will be more eaſily pronounced than the ſucceſſion of all the three at random. Sounds of which the articulation is eaſieſt, are moſt completely in the power of the ſpeaker. He can pronounce them ſlowly or rapidly, ſoftly or with force, at pleaſure. In this we imagine the power and advantage of alliteration is founded: for we would not lay any ſtreſs on the pleaſure which can reſult to the ear from the repetition of the ſame letter. It has been compared to the frequent returns of the key-note in a muſical ſtrain; but that analogy is extremely faint. The ear, we preſume, can be pleaſed with alliteration only in ſo far as it contributes to the ſuperior eaſineſs of recitation; for what is recited with eaſe muſt be heard with pleaſure.

Theſe remarks might be confirmed and illuſtrated by numberleſs paſſages from the beſt poets. Some few lines will ſuffice, taken from Grey, who ſeems to have paid particular attention to this grace. He profeſſed to have learned his verſification from Dryden, as Dryden did from Spencer; and theſe three abound in alliteration above all the Engliſh poets. We chooſe Grey for another reaſon, in proof of what we mentioned before, that alliteration contributes not only to the *ſweetneſs*, but alſo to the *energy*, of verſification; for he uſes it chiefly when he aims at ſtrength and boldneſs. In the *Siſter Odes* (as Dr Johnſon ſtyles them), almoſt every ſtrophe commences and concludes with an alliterative line. The poet, we ſuppoſe, wiſhed to begin with force, and end with dignity.

"*R*uin ſeize thee, *r*uthleſs king."
"To *h*igh-born *H*oel's *h*arp, or ſoft *L*lewe*l*lyn's *l*ay."
"*W*eave the *w*arp, and *w*eave the *w*oof."
"Stamp we our vengeance *d*eep, and ratify his *d*oom."
"Regardleſs of the *ſ*weeping whirlwind's *ſ*way."
"That huſh'd in grim re*p*oſe, ex*p*ects his ev'ning *p*rey."

Alliteration, Allium.

It muſt be obſerved here, that we hold a verſe alliterative which has a letter repeated on its accented parts, although thoſe parts do not begin words; the repeated letter bearing a ſtrong analogy to the bars in a muſical phraſe. Gray ſeems to have had a particular liking to theſe ſort of balanced verſes, which divide equally, and of which the oppoſite ſides have an alliterative reſemblance.

"Eyes that *g*low, and fangs that *g*rin,
"Thoughts that *b*reathe, and words that *b*urn."
"*H*auberk craſh, and *h*elmet ring."

All theſe lines appear to us to have a force and energy, ariſing from alliteration, which renders them eaſy to be recited; or, if the reader pleaſes, *mouthed*. For the ſame reaſon the following paſſage appears ſad and ſolemn, by the repetition of the labial liquid.

"*M*ountains, ye *m*ourn in vain."
"*M*odred, whoſe *m*agic ſong,"—&c.

If alliteration thus contributes to enforce the expreſſion of a poetical ſentiment, its advantages in poetry muſt be conſiderable. It is not, therefore, unworthy a poet's regard in the act of compoſition. If two words offer of equal propriety, the one alliterative the other not, we think the firſt ought to be choſen. We would compare this to the practice of fuguing in muſic. A compoſer who aims at expreſſion will not hunt after fugues; but if they offer, if they ſeem to ariſe ſpontaneouſly from the ſubject, he will not reject them. So a good poet ought not to ſelect an epithet merely for beginning with a certain letter, unleſs it ſuit his purpoſe well in every other reſpect; for the beauty of alliteration, when happy, is not greater than its deformity when affected. A couplet from Pope will exemplify both; the firſt line being bad, and the ſecond good:

"Eternal beauties grace the *ſ*hining *ſ*cene,
"*F*ields ever *f*reſh, and *g*roves for ever *g*reen."

ALLIUM (from 'αλεω, "to avoid or ſhun," becauſe many ſhun the ſmell of it), Garlic: A genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method ranking in the 9th order, *Spathaceæ*. The characters are: The *calix* is a common ſpatha, roundiſh, withering, and multiflorous: The *corolla* conſiſts of ſix oblong petals: The *ſtamina* have ſix ſubulated filaments, often the length of the corolla; the antheræ are oblong and erect: The *piſtillum* has a germen above, ſhorter, nearly three-cornered, with angles engraved with a line; the ſtyli are ſimple, the ſtigmata acute: The *pericarpium* is a very ſhort, broad, three-lobed capſule, with three cells and three valves: The *ſeeds* are many and roundiſh. Of this genus no fewer than 40 different ſpecies are enumerated by Linnæus, among which he includes the cepa and porrum, or onions and leeks.

1. The ſativum, or garlic, has a bulbous root, of an irregularly roundiſh ſhape, with ſeveral fibres at the bottom; each root is compoſed of a number of leſſer bulbs, called *cloves* of garlic, incloſed in one common

Allium. membranous coat, and eafily feparable from one another. All the parts of this plant, but more efpecially the roots, have an acrimonious, and almoft cauftic tafte, with a ftrong offenfive fmell, which laft has induced thofe who preferved fome of the fpecies in gardens on account of their yellow flowers, to eradicate them.

This pungent root warms and ftimulates the folids, and attenuates tenacious juices; for which it is well adapted, on account of its being very penetrating; infomuch that, when applied to the feet, its fcent is foon difcovered in the breath; and, when taken internally, its fmell is communicated to the urine, or the matter of an iffue, and perfpires through the pores of the fkin. Hence, in cold eucophlegmatic habits, it proves a powerful expectorant, diuretic, and emmenagogue; and, if the patient is kept warm, fudorific. It is alfo of great fervice in humoral afthmas and catarrhous diforders of the breaft, and in other diforders proceeding from a laxity of the folids, and cold fluggifh indifpofitions of the fluids. It is alfo frequently of fervice in the dropfy; in the beginning of which it is particularly recommended by Sydenham, as a warm ftrengthening medicine: we have even many examples where it acts fo powerfully as a diuretic, as to carry off all the water of dropfies. It may be taken the length of a dram or two in fubftance for a dofe.—We have a fyrup and oxymel made with it, which may be employed for the fame purpofes as the garlic in fubftance; but they are moftly ufed in pulmonic diforders. —Externally applied, it inflames and ulcerates the fkin, and is fometimes employed for this ufe in finapifms. It has alfo been recommended by Sydenham as a moft powerful revellent; for which purpofe he was led to make ufe of it in the confluent fmall-pox. His method was to cut the root in pieces, and apply it, tied in a linen cloth, to the foles of the feet, about the eighth day of the difeafe, after the face began to fwell; renewing it once a-day till the danger was over.—When made into an unguent with oils, and applied externally, garlic is faid to refolve and difcufs cold tumours, and has been by fome greatly celebrated in cutaneous diforders.

The acrimonious qualities of this root, however, render it manifeftly improper on many occafions. Its liberal ufe is apt to occafion head-achs, flatulencies, thirft, febrile heats, inflammatory diftempers, and fometimes difcharges of blood from the hemorrhoidal veffels. In hot bilious conftitutions, where there is already a degree of irritation, where the juices are too thin and acrimonious, or the vifcera unfound, it never fails to aggravate the diftemper.

In Kamtfchatka, the allium urfinum, or wild garlic, is very common and ufeful in medicine as well as food. Both Ruffians and natives gather it in great quantities for winter fervice. They fteep it in water, then mix it with cabbage, onions, and other ingredients, and form out of them a ragout which they eat cold. It is alfo the principal remedy for the fcurvy. As foon as this plant appears above the fnow, they feem to put this dreadful diforder at defiance, and find a cure almoft in its worft ftages.

Garlic is very hardy, and will thrive in almoft any foil or fituation. It is eafily propagated either by the roots or feeds. If from the roots, they ought to be planted in autumn, that they may take good root in the ground before the fpring, which is neceffary to make them flower ftrong the following fummer. If they are propagated by feeds, they may be fown on a border of common earth, either in autumn foon after the feeds are ripe, or in the fpring following; and will require no farther care than to keep them clear from weeds. In the following autumn, they may be tranfplanted into the borders where they are to remain.

2. The afcalonicum, or efchalot, was found wild in Paleftine by Dr Haffelquift. The root is conglobate, confifting of many oblong roots bound together by thin membranes. Each of thefe fmall roots fends forth two or three fiftulous, long, awl-fhaped leaves, iffuing from a fheath, and are nearly like thofe of the common onion. The flower-ftem fhoots from a membranaceous fheath; is round, almoft naked, and terminated by a globular umbel of flowers, which have erect, purplifh, lance-fhaped petals, of the length of the ftamina.—The root of this fpecies is very pungent, has a ftrong, but not unpleafant fmell, and therefore is generally preferred to the onion for making high-flavoured foups and gravies. It is alfo put into pickles, and in the Eaft Indies they ufe an abundance of it for this purpofe.

3. The fcorodoprafum, or rokambole, grows naturally in Denmark and Sweden. It hath a heart-fhaped folid root, which ftands fidewife of the ftalk. The leaves are broad, and are a little crenated on their edges. The flowers are of a pale purple colour, and collected into a globular head. The roots are ufed for the fame purpofe as the former.

4. The fchœnoprafum, or cives, is an inhabitant of Siberia, and is a very fmall plant compared with the former, the leaves and ftems feldom exceeding fix inches in length, and the roots never producing any bulbs. The leaves are awl-fhaped, hollow, and the ftem naked. It was formerly in great requeft for mixing with falads in the fpring, but has been little regarded lately. Its tafte, fmell, and virtues, are much the fame as thofe of the common onion. It is propagated by parting the roots.

5. The cepa, or common onion, differs from the garlic only in the fwelling pipy ftalk, which is much larger in the middle than at either end.—From whence this was firft brought into Europe is not known; but that it is not natural to Africa is beyond a doubt, it being evident that onions were eaten by the Egyptians above 2000 years before Chrift; and they make a great part of their conftant food to this day in Egypt. Dr Haffelquift fays it is not to be wondered at that the Ifraelites fhould long for them after they had left this place; for whoever has tafted onions in Egypt muft allow, that none can be had better in any part of the univerfe. Here, he obferves, they are fweet, in other countries they are naufeous and ftrong. Here they are foft; whereas in the north and other parts they are hard, and their coats fo compact that they are difficult to digeft. They eat them roafted, cut into four pieces, with fome bits of roafted meat, which the Turks call *kebab;* and with this difh they are fo delighted, that they wifh to enjoy it in paradife. They likewife make a foup of them in Egypt, which Haffelquift fays is one of the beft difhes he ever eat. The many ways of dreffing onions in Britain are known to every family: but in regard to wholefomenefs, there is certainly no method equal to boiling; as thus they are rendered mild, of eafy digeftion, and go off without leaving thofe heats in the ftomach and bowels, which

Allium. which they are apt to do any other way. Their nature is to attenuate thick, viſcid juices; conſequently a plentiful uſe of them in cold phlegmatic conſtitutions muſt prove beneficial. Many people ſhun them on account of the ſtrong, diſagreeable ſmell they communicate to the breath. This may be remedied by eating a few raw parſley leaves immediately after, which will effectually overcome the ſcent of the onions, and cauſe them to ſit more eaſy on the ſtomach.

The varieties are, the Straſburgh, the Spaniſh, and the Egyptian onion. They are propagated by ſeeds, which ſhould be ſown the latter end of February, or the beginning of March, on good, light, rich ground, well dug and levelled, and cleared from weeds. They ſhould alſo be ſown at a time when the ſurface of the ground is not moiſt; and where they are intended for a winter crop, they muſt not be ſown too thick. The common allowance is ſix pounds of ſeed to an acre; though ſome allow more, in order to have a crop to draw out, which they call *cullings*. In about ſix weeks after, the onions will be up and forward enough to hoe; at which time the weeds ſhould be lightly cut up with a ſmall hoe about two inches and a half broad, as alſo the onions themſelves where they grow too cloſe in bunches, leaving them at this firſt time at leaſt two or three inches apart. This, if properly performed, and in a dry ſeaſon, will preſerve the ground clear of weeds at leaſt a month, when they muſt be hoed over again, leaving them at this time about four or five inches aſunder. In ſix weeks after they muſt be hoed a third time. The weeds are now to be carefully cut up, and the onions ſingled out ſo as to leave them about ſix inches ſquare; by which means they will grow much larger than if left too cloſe. This, if well performed, in caſe the weather proves dry, will keep the onions till they are fit to pull: but if the weather ſhould prove moiſt, and any of the weeds take root again, the weeds muſt be pulled out with the hand; for the onions having now begun to bulb, muſt not be diſturbed with a hoe. Towards the middle of Auguſt the onions will have arrived at their full growth, which may be known by their blades falling to the ground and ſhrinking. At this time, therefore, before their necks or blades are withered off, they ſhould be drawn out of the ground, the extreme part of the blade cut off, and the onions laid upon a dry ſpot of ground, obſerving to turn them every other day at leaſt, to prevent them from taking root again; which in moiſt weather they would be apt to do. At any rate, they are very apt to grow in the lofts where they are kept all winter; the moſt effectual method of preventing which is, with a hot iron, ſlightly to touch their beards or roots, which will effectually prevent their ſprouting; but in doing this, great caution muſt be uſed not to ſcorch the pulp, for that will cauſe them to periſh ſoon after. In order to ſave ſeeds, you muſt in the ſpring make choice of ſome of the largeſt, firmeſt, and beſt ſhapen onions (in quantity proportionable to the ſeed you intend to ſave), and having prepared a piece of good ground, which ſhould be well dug, and laid out in beds about three feet wide, the onions muſt be planted in the beginning of March in the following manner: Having ſtrained a line of about four inches within the ſide of the bed, you muſt with a ſpade throw out an opening ſix inches deep, the length of the bed, into which you ſhould place the onions with their roots downward, at about nine inches diſtance from each other; and with a rake draw the earth into the opening again to cover the bulbs; then proceed to remove the line again about a foot farther back, where you muſt make an opening as before, and ſo again, till the whole is finiſhed, by which you will have four rows in each bed; between each bed you muſt allow the ſpace of two feet for an alley to go among them. In a month's time the leaves will appear above ground, and many of the roots will produce three or four ſtalks each. About the beginning of June, when the flowers begin to appear, the ſtalks muſt be tied to ſtakes to prevent them from being broke by their own weight. About the end of Auguſt the ſeed will be ripe; which may be known by the opening of the cells which contain it, and its changing to a brown colour. When the heads are cut off, they ſhould be ſpread abroad upon coarſe cloths in the ſun, obſerving to keep it under ſhelter in the night, as alſo in wet weather. When the heads are quite dry, the ſeeds ſhould be beat out from them; and after being cleared from the huſks, and expoſed one day to the ſun to dry, they may be put up in bags for uſe.

Allium, Allix.

Beſides the above-mentioned ſorts of onions, the ſcallions or eſcallions, and Welſh onions, were formerly in great repute. The former is a ſort which never forms any bulbs at the roots, and was chiefly uſed in the ſpring for green onions; but is now become ſo ſcarce as hardly to be known. Some gardeners, inſtead of the ſcallion, ſubſtitute ſuch onions as decay and ſprout in the houſe. Theſe they plant in a bed early in the ſpring, and in a ſhort time they become large enough for uſe. The true ſcallion is eaſily propagated by parting the roots either in ſpring or autumn; but the latter is preferable. The roots ſhould be planted three or four in a hole, and about ſix inches diſtance every way.—The Welſh onions are propagated only for ſpring uſe; they never make any bulbs, and are therefore fit only to be uſed green for ſalads. They are ſown in the end of July, in beds about three feet and a half wide. In a fortnight's time they appear above ground; but in October their blades die, and the ground becomes quite naked. In January, however, they will again appear very ſtrong, and in March will be fit to draw for young onions.

6. The porrum, or leek, has been ſo long cultivated, that its native place of growth cannot be traced. It is undoubtedly the ſame as that mentioned in the eleventh Chap. of Numbers, where it is ſaid the Iſraelites longed for leeks in conjunction with onions. The leaves are much of the ſame nature as thoſe of the latter, and they are yet a conſtant diſh at the tables of the Egyptians, who chop them ſmall and then eat them with their meat. They are in great eſteem, too, with the Welſh, and their general uſe as a pot-herb is well known.—Their culture is the ſame with that of the onion.

ALLIX (Dr Peter), a learned French Proteſtant divine, born at Alencon in 1641. He became miniſter of the reformed church at Rouen, where he publiſhed many learned and curious pieces; the credit of which induced the reformed to call him to Charenton, about a league from Paris, being the principal church they

they had in France. On the revocation of the edict of Nantz, he retired to England; where he studied the language with so much success, as to publish a work, intitled *Reflections on the Books in the Holy Scriptures, to establish the Truth of the Christian Religion*, 2 vols; which he dedicated to James II. acknowledging his obligations to that prince, and his kind behaviour to the distressed refugees in general. He wrote several other treatises relating to ecclesiastical history; which rendered him as famous in England as in France, for his ingenious and solid defences of the reformed religion. He was complimented with the degree of D.D. and in 1690 was made treasurer of the church of Salisbury. He died in 1717.

ALLOA, or Alloway, a sea-port town in Scotland, seated on the Forth, about 20 miles higher up the river than Leith, and five miles east of Stirling. It is a populous place; has two market-days in the week; and is remarkable for its fine castle the seat of the Earl of Mar, and for the coal-mines near it. The harbour is extremely commodious, with great depth of water; and vessels are expeditiously loaded with coals from the pits by an uncommon waggon-way, on which one horse draws with ease three waggons at once, each waggon containing a tun and a half. An excellent dry-dock has also been lately erected here, capable of receiving ships of the greatest burden. There is likewise a large glass-house for blowing bottles, of which vessels are supplied with any quantity upon the shortest notice.

The tower and lands of Alloa were exchanged by David II. king of Scots, *anno* 1365, with Thomas Lord Erskine, for the lands and estate of Strathgartney in Perthshire; and since that time the castle of Alloa has been the favourite residence of the family of Mar. The situation is uncommonly beautiful. The gardens here were the first that were laid out on a great scale in Scotland; and, with the advice of Le Nautre, were indebted to the taste of John the late Earl of Mar, who began to plant them in the year 1706. They contain about 40 acres; and would have exhibited to Dr Johnson, had he travelled that way, as fine timber of fourscore years growth as his favourite England can produce.

The tower of Alloa is 89 feet in height, with walls of 11 feet in thickness; and was built in the end of the 13th century. In this residence of the family of Erskine many of the Scottish princes received their education, having been for more than two centuries the wards of the Lords Erskine and Earls of Mar; who held generally the castle of Stirling, and frequently the three principal fortresses of the kingdom, Edinburgh, Stirling, and Dunbarton. The last heir of the Scottish monarchy who was nurtured there was Henry Prince of Wales; whose cradle, golf-clubs, and other infantine and youthful remains, are preserved by the heir of the Earls of Mar, in remembrance of that spirited and promising prince; of whom Dr Birch has preserved several anecdotes, connected with the Erskines and his residence at Alloa.—Among other remains of antiquity preserved at Alloa, in remembrance of the confidence and affection which subsisted always betwixt the Stuarts and the Erskines, is the private signet of the unfortunate Mary, which she gave to the regent Mar, after she was obliged by the treaty of Edinburgh to desist from wearing the arms of England in the first quarter; the child's-chair of James VI. her son; and the festive-chair of Thomas Lord Erskine the second Earl of Mar of the name, with the fashionable grace carved on it, *Soli Deo Honor et Gloria*.

ALLOBROGES (Inscriptions, Livy, Velleius, Flarus); from *Allobrox* (Horace): a people of Gallia Narbonensis, situated between the rivers Isara and Rhodanus, and the Lacus Lemanus; commended by Cicero for their fidelity, discommended by Horace on account of their fondness for novelty.

ALLOCATION denotes the admitting or allowing of an article of an account, especially in the exchequer. Hence,

Allocatione Facienda, is a writ directed to the lord treasurer, or barons of the exchequer, commanding them to allow an accountant such sums as he has lawfully expended in the execution of his office.

ALLOCUTIO, an oration or speech of a general addressed to his soldiers, to animate them to fight, to appease sedition, or to keep them to their duty. A mount of earth was raised upon the occasion, as it were a kind of tribunal of turf. From this the general pronounced his harangue to the army, which was ranged in several squadrons round him, with their captains at their head. When the time and circumstances would not admit of a formal harangue, the general went through the ranks, and called each by his name, putting them in mind of their courage upon former occasions, mentioning the victories they had won, and making promises of plunder.

ALLODIUM, or Alleud, denotes lands which are the absolute property of their owner, without being obliged to pay any service or ackowledgment whatever to a superior lord. See Fee and *Feodal System*.

ALLOPHYLLUS, in botany; a genus of the monogynia order, belonging to the octandria class of plants. The characters of which are: The *calyx* is a four-leaved perianthium, with orbicular leaflets, the opposite ones less: The *corolla* consists of four orbicular equal petals, less than the calyx; the claws broader, the length of the smaller leaves of the calyx: The *stamina* consist of eight slender filaments, the length of the corolla; the antheræ are roundish: The *pistillum* has a round didymous germen above; the stylus is filiform, and longer than the stamina; and the stigma is bifid, with revolute divisions. There is but one species, the zeylanicus, a native of Ceylon.

ALLOTTING, or *Allotment, of Goods*, in matters of commerce, is when a ship's cargo is divided into several parts, bought by divers persons, whose names are written on as many pieces of paper, which are applied by an indifferent person to the several lots or parcels; by which means the goods are divided without partiality, every man having the parcel which the lot with his name on is appropriated.

ALLOY, or Allay, properly signifies a proportion of a baser metal mixed with a finer one. The alloy of gold is estimated by carats, that of silver by pennyweights. (See Gold, &c.) In different nations, different proportions of alloy are used; whence their moneys are said to be of different degrees of fineness or baseness, and are valued accordingly in foreign exchanges.—The chief reasons alleged for the alloying of

of coin are: 1. The mixture of the metals, which, when fmelted from the mine, are not perfectly pure. 2. The faving the expence it muft otherwife coft if they were to be refined. 3. The neceffity of rendering them harder, by mixing fome parts of other metals with them, to prevent the diminution of weight by wearing in paffing from hand to hand. 4. The melting of foreign gold or coin which is alloyed. 5. The charges of coinage, which muft be made good by the profit arifing from the money coined. 6. and laftly, The duty belonging to the fovereign, on account of the power he has to caufe money to be coined in his dominions.

In a more general fenfe, the word is employed in chemiftry to fignify the union of different metallic matters.—As an infinity of different combinations may be made according to the nature, the number, and the proportions of the metallic matters capable of being alloyed, we fhall not here enter into the detail of the particular alloys, all which are not yet nearly known. Thofe which are ufed, as *Bronze*, *Tombac*, *Brafs*, *White Copper*, &c. may be found under their particular names; and what is known concerning other alloys may be found under the names of the different metals and femimetals.

ALLUM. See Alum.

ALLUMINOR, from the French *alumer*, "to lighten," is ufed for one who coloureth or painteth upon paper or parchment; and the reafon is, becaufe he gives light and ornament by his colours to the letters or other figures. Such ornaments are ftyled *illuminations*. The word is ufed in ftat. 1. R. III. cap. 9. But now fuch a perfon is called a *limner*.

ALLUSH, (anc. geog.) The Ifraelites being in the wildernefs of Shur, departed from Dophkah, and went to Allufh, from whence they proceeded to Rephidim; Num. xxxiii. 13, 14. Eufebius and St Jerom fix Allufh in Idumæa, about Gabala or Petra, the capital of Arabia Petræa. In the accounts of the empire, it is fituated in the third Paleftine; and by Ptolemy, among the cities of Idumæa.

ALLUSION, in rhetoric, a figure by which fomething is applied to, or underftood of, another, on account of fome fimilitude between them.

ALLUVION, in law, denotes the gradual increafe of land along the fea-fhore, or on banks of rivers.

ALLY, in matters of polity, a fovereign prince or ftate that has entered into alliance with others. See Alliance.

ALMACANTARS. See Almucantars.

ALMACARRON, a fea-port town of Spain, in the province of Murcia, at the mouth of the river Guadalantin. It is about twenty miles weft of Carthagena, and is remarkable for the prodigious quantity of alum found in its territory. W. Long. 1. 15. N. Lat. 37. 40.

ALMADE, a town of Spain, in the province of La Mancha, in the kingdom of Caftile, fituated upon the top of a mountain, where are the moft ancient as well as the richeft filver mines in Europe.

ALMADIE, a kind of canoe, or fmall veffel, about four fathoms long, commonly made of bark, and ufed by the negroes of Africa.

Almadie is alfo the name of a kind of long-boats, fitted out at Calicut, which are eighty feet in length, and fix or fiven in breadth. They are exceedingly fwift, and are otherwife called *cathuri*.

ALMAGEST, in matters of literature, is particularly ufed for a collection or book compofed by Ptolemy, containing various problems of the ancients both in geometry and aftronomy.

Almagest is alfo the title of other collections of this kind. Thus, Riccioli has publifhed a book of aftronomy, which he calls the *New Almageft*; and Pluckenet, a book which he calls *Almageftrum Botanicum*.

ALMAGRA, a fine deep red ochre, with fome admixture of purple, very heavy, and of a denfe yet friable ftructure, and rough dufty furface. It adheres very firmly to the tongue, melts freely and eafily in the mouth, is of an auftere and ftrongly aftringent tafte, and ftains the fkin in touching. It is the *Sil Atticum* of the ancients: it ferments very violently with acid menftruums; by which fingle quality, it is fufficiently diftinguifhed from the *Sil Syricum*, to which it has in many refpects a great affinity. It is found in immenfe quantities in many parts of Spain; and in Andalufia there are in a manner whole mountains of it. It is ufed in painting, and in medicine as an aftringent.

ALMAGRO, a fortrefs of Spain, the capital of one of the diftricts of La Mancha. It was built by the archbifhop Roderic of Toledo, who finifhed it in 1214, and put a confiderable garrifon into it to reftrain the incurfions of the Moors. This was hardly done, when the fortrefs was befieged by an army of 5000 horfe and foot, under the command of a Moorifh officer of great reputation; but the prelate, its founder, took care to fupply thofe within with fuch plenty of neceffaries, that at length the enemy found themfelves obliged to raife the fiege and retire with great lofs.

ALMANACK, a book, or table, containing a calendar of days and months, the rifing and fetting of the fun, the age of the moon, the eclipfes of both luminaries, &c.—Authors are divided with regard to the etymology of the word; fome deriving it from the Arabic particle *al*, and *manach*, to count; fome from *almanah*, new-year's gifts, becaufe the Arabian aftrologers ufed at the beginning of the year to make prefents of their ephemerides; and others, from the Teutonic *almaen-achte*, obfervations on all the months. Mr Johnfon derives it from the Arabic particle *al*, and the Greek μην, a month. But the moft fimple etymology appears from the common fpelling; the word being compofed of two Arabic ones, *Al Manack*, which fignify *the Diary*. All the claffes of Arabs are commonly much given to the ftudy of aftronomy and aftrology; to both which a paftoral life, and a fort of hufbandry, not only incline them, but give them time and leifure to apply themfelves to them. They neither fow, reap, plant, travel, buy or fell, or undertake any expedition or matter, without previoufly confulting the ftars, or, in other words, their almanacks, or fome of the makers of them. From thefe people, by their vicinity to Europe, this art, no lefs ufeful in one fenfe than ftupid and ridiculous in another, hath paffed over hither: and thofe aftronomical compofitions have ftill every where not only retained their old Arabic name; but were, like theirs, for a long while, and ftill are among many European nations, interfperfed with a great number of aftrological rules for planting, fowing, bleeding, purging, &c. down to the cutting of the hair and paring

of

Almanack. of the nails.—Regiomontanus appears to have been the first in Europe, however, who reduced almanacks into their present form and method, gave the characters of each year and month, foretold the eclipses and other phases, calculated the motions of the planets, &c. His first almanack was first published in 1474.

Almanacks differ from one another, chiefly, in containing some more, others fewer, particulars.

The essential part is the calendar of months and days, with the risings and settings of the sun, age of the moon, &c. To these are added various parerga, astronomical, meteorological, chronological, political, rural, &c. as calculations and accounts of eclipses, solar ingresses, prognostics of the weather, tables of the tides, terms, &c. lists of posts, offices, dignities, public institutions, with many other articles political as well as local, and differing in different countries.—A great variety are annually published in Britain; some for binding, which may be denominated *book-almanacks;* others in loose papers, called *sheet-almanacks.*

The modern almanack answers to the *Fasti* of the ancient Romans. See FASTI.

Construction of ALMANACKS. The first thing to be done is, to compute the sun's and moon's place for each day of the year, or it may be taken from some ephemerides and entered into the almanack; next, find the dominical letter, and, by means thereof, distribute the calendar into weeks; then, having computed the time of easter, by it fix the other moveable feasts; adding the immoveable ones, with the names of the martyrs, the rising and setting of each luminary, the length of day and night, the aspects of the planets, the phases of the moon, and the sun's entrance into the cardinal points of the ecliptic, *i. e.* the two equinoxes and solstices. (See ASTRONOMY, *passim.*) By the help of good astronomical tables or ephemerides, the construction of almanacks is extremely easy.

Almanacks for one year printed on one side of paper, pay of duty 4d.; those for more years pay for three years 1d.; but perpetual almanacks are to pay only for three years at 2d. Out of the duties by this act there shall be paid to each university L. 500 *per ann.* half yearly, at Midsummer and Christmas, and the surplus shall be paid into the exchequer to go to the sinking fund. Selling unstamped almanacks incurs the same penalty as for selling unstamped newspapers. Almanacks in bibles and common prayer books are exempted.

ALMANACK, among antiquaries, is also the name given to a kind of instrument, usually of wood, inscribed with various figures and Runic characters, and representing the order of the feasts, dominical letters, days of the week, and golden number, with other matters necessary to be known throughout the year; used by the ancient northern nations, in their computations of time, both civil and ecclesiastical. Almanacks of this kind are known by various names, among the different nations wherein they have been used; as rimstocks, primstaries, runstocks, runstaffs, *Scipiones Runici, Bacculi Annales,* clogs, &c. They appear to have been used only by the Swedes, Danes, and Norwegians. From the second of these people, their use was introduced into England, whence divers remains of them in the counties. Dr Plot has given the description and figure of one of these clogs, found in Staffordshire, under the title of *The perpetual Staffordshire Almanack.* The external figure and matter of these calendars appear to have been various. Sometimes they were cut on one or more wooden leaves, bound together after the manner of books; sometimes on the scabbards of swords, or even on daggers; sometimes on tools and implements, as portable steelyards, hammers, the helves of hatchets, flails, &c. Sometimes they were made of brass or horn; sometimes of the skins of eels, which, being drawn over a stick properly inscribed, retained the impressions of it. But the most usual form was that of walking-staves, or sticks, which they carried about with them to church, market, &c. Each of these staves is divided into three regions; whereof the first indicates the signs, the second the days of the week and year, and the third the golden number. The characters engraven on them are, in some, the ancient Runic; in others, the later Gothic characters of Ulfilus. The saints days are expressed in hieroglyphics, significative either of some endowment of the saint, the manner of his martyrdom, or the like. Thus, against the notch for the first of March, or St David's day, is represented a harp; against the 25th of October, or Crispin's day, a pair of shoes; against the 10th of August, or St Lawrence's day, a gridiron; and, lastly, against New-year's day, a horn, the mark of good drinking, which our ancestors gave a loose to at that season.

Almanza, Heresy of Almaric.

ALMANZA, a little town of New-Castile, on the frontiers of the kingdom of Valencia in Spain, situated in W. Long. 1. 19. N. Lat. 38. 54. It is remarkable for the defeat of the allies in 1707, under the Marquis de las Minas and the Earl of Galway. In the beginning of this action, the English troops penetrated thro' the centre of the Spanish army; but the Portuguese cavalry being broken by the Spanish, and the French infantry making a dreadful fire on their flanks, the allied army was at last broken, and began their retreat when it was almost dark. Colonel Hill carried off the remains of thirteen battalions towards the river Xucar, which, if they could have passed, they might have been safe: but being very much fatigued, they were obliged to halt; by which means they were surrounded, and forced to surrender prisoners of war. In this battle, the allies lost 120 standards, together with all their artillery and baggage; a great number were killed, and several thousands taken prisoners. The Marquis de las Minas was dangerously wounded; and his mistress, in the garb of an amazon, killed by his side. The earl of Galway had two cuts cross the face, which, though not dangerous, had prevented him from seeing, or giving orders properly.

HERESY OF ALMARIC, a tenet broached in France by one Almaric, in the year 1209. It consisted in affirming, that every Christian was actually a member of Christ; and that without this faith no one could be saved. His followers went farther, and affirmed, that the power of the Father lasted only during the continuance of the Mosaic law; that the coming of Christ introduced a new law; that at the end of this began the reign of the Holy Ghost; and that now confession and the sacraments were at an end, and that every one is to be saved by the internal operations of the Holy Spirit alone, without any external act of religion.—Their morals were as infamous as their doctrine was

was abfurd. Their tenets were condemned by a public decree of the council of Sens, in the year 1209.

ALME, or ALMA, finging and dancing girls in Egypt, who, like the Italian *Improvifatori*, can occafionally pour forth "unpremeditated verfe." They are called *Almé*, from having received a better education than other women. They form a celebrated fociety in this country. To be received into it, according to Mr Savary, it is neceffary to have a good voice, to underftand the language well, to know the rules of poetry, and be able to compofe and fing couplets on the fpot, adapted to the circumftances. The Almé know by heart all the new fongs. Their memory is furnifhed with the moft beautiful tales. There is no feftival without them; no entertainment of which they do not conftitute the ornament. They are placed in a roftrum, from whence they fing during the repaft. They then defcend into the faloon, and form dances which have no refemblance to ours. They are pantomime ballets, in which they reprefent the ufual occurrences of life. The myfteries of love too, generally furnifh them with fcenes. The fupplenefs of their bodies is inconceivable. One is aftonifhed at the mobility of their features, to which they give at pleafure the impreffion fuited to the characters they play. The indecency of their attitudes is often carried to excefs. Their looks, their geftures, every thing fpeaks, but in fo expreffive a manner, that it is impoffible to miftake them. At the beginning of the dance, they lay afide with their veils the modefty of their fex. A long robe of very thin filk goes down to their heels, which is flightly faftened with a rich girdle. Long black hair, plaited and perfumed, is flowing on their fhoulders. A fhift, tranfparent as gauze, fcarcely hides their bofom. As they put themfelves in motion, the fhapes, the contours of their bodies, feem to develope themfelves fucceffively. Their fteps are regulated by the found of the flute, of caftanets, the tambour de bafque, and cymbals, which accelerates or retards the meafure. They are ftill further animated by words adapted to fuch fcenes. They appear in a ftate of intoxication. They are the Bacchants in a delirium. It is when they are at this point, that throwing off all referve, they abandon themfelves totally to the diforder of their fenfes; it is then that a people far from delicate, and who like nothing hidden, redouble their applaufes. Thefe Almé are fent for into all the harams. They teach the women the new airs; they amufe them with amorous tales, and recite in their prefence poems, which are fo much the more interefting, as they furnifh a lively picture of their manners. They initiate them into the myfteries of their art, and teach them to contrive lafcivious dances. Thefe girls, who have a cultivated underftanding, are very agreeable in converfation. They fpeak their language with purity. The habit of dedicating themfelves to poetry renders the fofteft and moft fonorous expreffions familiar to them. They repeat with a great deal of grace. In finging, nature is their only guide. Sometimes two of them fing together, but always with the fame voice. It is the fame with an orcheftra, where all the inftruments playing in unifon execute the fame part.

The Almé affift at the marriage ceremonies, and march before the bride, playing on inftruments. They make a figure likewife at funerals, and accompany the proceffion, finging forrowful airs. They break forth into groans and lamentations, and give every fign of grief and defpair. Thefe women are paid very high, and feldom appear but amongft the grandees and rich men.

The common people have alfo their Almé. They are girls of the fecond clafs, who try to imitate the former; but they have neither their elegance, their graces, nor their knowledge. They are every where to be met with. The public places and the walks about Grand Cairo are full of them. As the populace require allufions ftill more ftrongly marked, decency will not permit the relation to what a pitch they carry the licentioufnefs of their geftures and attitudes.

ALMEDIA, a frontier-town of Portugal, in the province of Tralos Montes, on the confines of Leon, where there was a very brifk action between the French and Portuguefe in 1663; 17 miles N. W. of Cividad Rodrigo. W. Long, 7. 10. N. Lat. 40. 41.

ALMEHRAB, in the Mahometan cuftoms, a nich in their mofques, pointing towards the kebla or temple of Mecca, to which they are obliged to bow in praying. See KEBLA.

ALMEISAR, a celebrated game among the ancient Arabs, performed by a kind of cafting of lots with arrows, ftrictly forbid by the law of Mahomet, on account of the frequent quarrels occafioned by it.

The manner of the game was thus: A young camel being brought and killed, was divided into a number of parts. The adventurers, to the number of feven, being met, 11 arrows were provided without heads or feathers; feven of which were marked, the firft with one notch, the fecond with two, the third with three, &c. the other four had no marks. Thefe arrows were put promifcuoufly into a bag, and thus drawn by an indifferent perfon. Thofe to whom the marked arrows fell, won fhares in proportion to their lot; the reft to whom the blanks fell, were intitled to no part of the camel, but obliged to pay the whole price of it. Even the winners tafted not of the flefh themfelves more than the lofers, but the whole was diftributed to the poor.

ALMENE, in commerce, a weight of two pounds ufed to weigh faffron in feveral parts of the continent of the E. Indies.

ALMERIA, a fea-port town in the kingdom of Granada in Spain, pleafantly fituated in a fine bay at the mouth of the river Almeria, on the Mediterranean: W. Long. 3. 20. N. Lat. 36. 51. This town is by fome thought to have rifen upon the ruins of the ancient Abdera, and was formerly a place of great confequence. It was taken from the Moors in 1147, by the emperor Conrad III. in conjunction with the French, Genoefe, and Pifans.—It was at that time the ftrongeft place in Spain, held by the infidels; from which their privateers, which were exceedingly numerous, not only troubled the fea-coafts inhabited by the Chriftians, but gave equal difturbance to the maritime provinces of France, Italy, and the adjacent iflands. The city being well fortified, having a ftrong caftle, a numerous garrifon, and being excellently provided with every thing neceffary, made a vigorous refiftance; but was at laft taken by ftorm, when the victor put to the fword all the inhabitants who were found in arms, diftributing the beft part of the plunder among his allies,

lies, whom he sent away thoroughly satisfied. The Genoese, particularly, acquired here that emerald vessel which still remains in their treasury, and is deemed invaluable.

Upon its reduction by the Christians Almeria became a bishopric; but is at present very little better than a village, indifferently inhabited, and has nothing to testify so much as the probability of its former greatness, except certain circumstances which cannot be effaced even by the indolence of the Spaniards themselves. What these are, Udal ap Rhys, a Welshman, thus describes, in his tour through Spain and Portugal. "Its climate (says he) is so peculiarly blessed, that one really wants words to express its charms and excellence. Its fields and meads are covered with flowers all the year round; they are adorned also with palms, myrtles, plane-trees, oranges, and olives; and the mountains and promontories near it are as noted for their producing a great variety of precious stones, insomuch that the next promontory to it is called the *Cape of Gates*, which is a corruption from the word *agates*, the hills thereabouts abounding in that sort of precious stones, as well as in emeralds and amethysts, granites or coarse rubies, and extreme curious alabaster in the mountains of Filaures."

ALMISSA, a small but strong town at the mouth of the Cetina, in Dalmatia, famous for its piracies; ten miles east of Spalatro. E. Long. 39. 33. N. Lat. 43. 56.

ALMOND, the fruit of the almond-tree. See AMYGDALUS.

ALMOND, in commerce, a measure by which the Portuguese sell their oil; 26 almonds make a pipe.

ALMONDS, in anatomy, a name sometimes given to two glands, generally called the *tonsils*.

ALMONDS, among lapidaries, signify pieces of rock-crystal, used in adorning branch-candlesticks, &c. on account of the resemblance they bear to the fruit of that name.

ALMOND-Furnace, among refiners, that in which the slags of litharge, left in refining silver, are reduced to lead again by the help of charcoal.

ALMONDBURY, a village in England, in the west-riding of Yorkshire, six miles from Halifax.

ALMONER, in its primitive sense, denotes an officer in religious houses, to whom belonged the management and distribution of the alms of the house. By the ancient canons, all monasteries were to spend at least a tenth part of their income in alms to the poor. The almoner of St Paul's is to dispose of the monies left for charity, according to the appointment of the donors, to bury the poor who die in the neighbourhood, and to breed up eight boys to singing, for the use of the choir. By an ancient canon, all bishops are required to keep almoners.

Lord ALMONER, or *Lord High ALMONER, of England*, is an ecclesiastical officer, generally a bishop, who has the forfeiture of all deodands, and the goods of *felos de se*, which he is to distribute among the poor. He has also, by virtue of an ancient custom, the power of giving the first dish from the king's table to whatever poor person he pleases, or, instead of it, an alms in money.

Great ALMONER, Grand AUMONIER, in France, is the highest ecclesiastical dignity in that kingdom. To him belongs the superintendency of all hospitals and houses of lepers. The king receives the sacrament from his hand; and he says mass before the king in all grand ceremonies and solemnities.

ALMONER is also a more fashionable title given by some writers to chaplains. In this sense we meet with almoner of a ship, almoner of a regiment.

ALMONRY, or AUMBRY, the office or lodgings of the almoner; also the place where alms are given. See AMBRY.

ALMS, a general term for what is given out of charity to the poor.

In the early ages of Christianity, the alms of the charitable were divided into four parts; one of which was allotted to the bishop, another to the priests, and a third to the deacons and subdeacons, which made their whole subsistence; the fourth part was employed in relieving the poor, and in repairing the churches.

No religious system is more frequent or warm in its exhortations to alms-giving than the Mahometan. The Alcoran represents alms as a necessary means to make prayer be heard. Hence that saying of one of their *khalifs*: "Prayer carries us half-way to God, fasting brings us to the door of his palace, and alms introduces us into the presence-chamber." Hence many illustrious examples of this virtue among the Mahometans. Hasan, the son of Ali, and grandson of Mohammed, in particular, is related to have thrice in his life divided his substance equally between himself and the poor, and twice to have given away all he had. And the generality are so addicted to the doing of good, that they extend their charity even to brutes.

ALMS, also denotes lands or other effects left to churches or religious houses, on condition of praying for the soul of the donor. Hence,

Free ALMS was that which is liable to no rent or service.

Reasonable ALMS was a certain portion of the estates of intestate persons, allotted to the poor.

ALMS-Box, or *Chest*, a small chest, or coffer, called by the Greeks κιβώτιον, wherein anciently the alms were collected, both at church and at private houses.

The alms-chest in English churches, is a strong box, with a hole in the upper part, having three keys, one to be kept by the parson or curate, the other two by the church-wardens. The erecting of such alms-chest in every church is enjoined by the book of canons, as also the manner of distributing what is thus collected among the poor of the parish.

ALMS-House, a petty kind of hospital, for the maintenance of a certain number of poor, aged, or disabled people.

ALMUCANTARS, in astronomy, an Arabic word denoting circles of the sphere passing through the centre of the sun, or a star, parallel to the horizon, being the same as *PARALLELS of Altitude*.

ALMUCANTARS-Staff, is an instrument usually made of pear-tree or box, having an arch of 15 degrees; used to take observations of the sun, about the time of its rising and setting; in order to find the amplitude, and consequently the variation of the compass.

ALMUCIUM, denotes a kind of cover for the head, worn chiefly by monks and ecclesiastics: It was of a square

square form, and seems to have given rise to the bonnets of the same shape still retained in universities and cathedrals.

ALMUGIM, or ALMUG-TREE, a certain kind of wood mentioned in the first book of Kings, (x. 11.) which the vulgate translates *ligna thyina*, and the Septuagint *wrought wood.* The Rabbins generally render it *coral;* others, *ebony*, *brazil*, or *pine*. But it is observed, that the almug-tree can by no means be coral, because that wood is not fit for the purposes that the Scripture tells us the almug-tree was used, such as musical instruments, stair-cases, &c. The word *thyinum* is a name for the citron-tree, known to the ancients, and very much esteemed for its sweet odour and great beauty. It came from Mauritania. The almug-tree, or almugim, algumim, or simply gummim, taking *al* for a kind of article, is therefore by the best commentators understood to be an oily and gummy sort of wood; and particularly that sort of tree which produces the gum ammoniac, which is also thought to be the same with the shittim-wood, whereof there is such frequent mention made by Moses.

ALMUNECAR, a sea-port town in the kingdom of Granada, seated on the Mediterranean, with a good harbour, defended by a strong castle, 20 miles south of Alhama. W. Long. 3. 45. N. Lat. 36. 50.

ALNAGE, or AULNAGE, the measuring of woollen manufactures with an ell. It was at first intended as a proof of the goodness of that commodity, and accordingly a seal was invented as a mark that the commodity was made according to the statute; but, it being now possible to purchase these seals, they are affixed, whenever the vender pleases, to all cloaths indiscriminately, to the great prejudice of our woollen manufactures.

ALNAGER, ALNEGER, or AULNEGER, q. d. *measurer by the ell;* signifies a sworn public officer, who by himself, or deputy, is to look to the assize of woollen cloth made throughout the land, i. e. the length, width, and work thereof; and to the seals for that purpose ordained. The office of king's aulnager seems to have been derived from the statute of Richard I. A.D. 1197, which ordained, that there should be only one weight and one measure throughout the kingdom; and that the custody of the assize, or standard of weights and measures, should be committed to certain persons in every city and borough. His business was, for a certain fee, to measure all cloths made for sale, till the office was abolished by the statute 11 and 12 W. III. cap. 20.

ALNUS, the ALDER-TREE, a species of betula. See BETULA.

ALNUS, in the ancient theatres, that part which was most distant from the stage.

ALNWICK, a thoroughfare town in Northumberland, on the road to Scotland. Here Malcolm, king of Scotland, making an inroad into Northumberland, was killed, with Edward his son, and his army defeated by Robert Mowbray, earl of this county, *anno* 1092. Likewise William, king of Scotland, in 1174, invading England with an army of 80,000 men, was here encountered, his army routed, and himself made prisoner. The town is populous, and in general well built; it has a large town-house, where the quarter-sessions and county-courts are held, and members of parliament elected. It has a spacious square, in which a market is held every Saturday. Alnwick appears to have been formerly fortified, by the vestiges of a wall still visible in many parts, and three gates which remain almost entire. It is governed by four chamberlains, who are chosen once in two years out of a common council, consisting of 24 members. It is ornamented by a stately old Gothic castle, which has been the seat of the noble family of Piercy, earls of Northumberland. As the audits for receipt of rents have ever been in this castle, it has always been kept in tolerable repair; and not many years ago, it was repaired and beautified by the duke of Northumberland, who made very considerable alterations, upon a most elegant plan, with a view to reside in it some part of the summer-season. The manner of making freemen is peculiar to this place, and indeed is as ridiculous as singular. The persons who are to be made free, or, as the phrase is, leap the well, assemble in the market-place, very early in the morning, on the 25th of April, being St Mark's day. They appear on horse-back, with every man his sword by his side, dressed in white, and with white night-caps, attended by the four chamberlains and the castle-bailiff, mounted and armed in the same manner; from hence they proceed, with music playing before them, to a large dirty pool, called *Freeman's-well*, where they dismount, and draw up in a body, at some distance from the water; and then rush into it all at once, and scramble through the mud as fast as they can. As the water is generally very foul, they come out in a dirty condition; but taking a dram, they put on dry clothes, remount their horses, and ride full gallop round the confines of the district; then re-enter the town, sword in hand, and are met by women dressed in ribbons with bells and garlands, dancing and singing. These are called *timber-wasts*. The houses of the new freemen are on this day distinguished by a great holly-bush, as a signal for their friends to assemble and make merry with them after their return. This ceremony is owing to king John, who was mired in this well; and who, as a punishment for not mending the road, made this a part of their charter. Alnwick is 310 miles north by west from London, 33 north of Newcastle, and 29 south of Berwick. Long. 1. 10. Lat. 55. 24.

ALOA, in Grecian antiquity, a festival kept in honour of Ceres by the husbandmen, and supposed to resemble our harvest-home.

ALOE, in botany, a genus of the monogynia order, belonging to the hexandria class of plants; and, in the natural method, ranking under the 10th order, *Coronariæ*. The characters are: There is no *calyx*: The *corolla* is monopetalous, erect, six-cleft, and oblong; the tube gibbous; the border spreading, and small; with a nectary-bearing bottom: The *stamina* consist of six subulated filaments, rather surpassing the corolla in length, and inserted into the receptacle; the antheræ are oblong and incumbent: The *pistillum* has an ovate germen; the stylus is simple, the length of the stamina; the stigma is obtuse and trifid: The *pericarpium* is an oblong capsule, three-furrowed, three-celled, three-valved: The *seeds* are many and angular. Of this genus, botanical writers enumerate ten species; of which the most remarkable are,

1. The disticha, by some called the *soap aloe*, by others

others *caballine aloe*. This feldom rifes above two feet high. The leaves are very broad at the bafe, where they clofely embrace the ftalk, and gradually decreafe to a point. The edges are fet with fharp fpines, and the under leaves fpread open horizontally every way. Thefe are of a dark green colour fpotted with white, fomewhat refembling the colour of foft foap, from whence the plant got the name of *foap-aloe*. The flowers grow in umbels on the tops of the ftalks, are of a beautiful red colour, and appear in Auguft and September. 2. The variegata, or partridge-breaft aloe, is a low plant, feldom rifing above eight inches high. The leaves of this are triangular, and curioufly veined and fpotted, fomewhat like the feathers of a partridge's breaft. The flowers grow in very loofe fpikes, and are of a fine red colour tipped with green. 3. The vifcofa, with funnel-fhaped flowers, grows near a foot high, with triangular leaves of a dark green colour. The flowers grow thinly upon very flender footftalks, are of an herbaceous colour, and their upper part turns backward. 4. The fpiralis, with oval crenated flowers, grows fomewhat like the former; only the flowers grow upon taller ftalks, which branch out and grow in very long clofe fpikes. 5. The linguisformæ, or tongue-aloe, has its leaves about fix inches in length, and fhaped like a tongue. The flowers grow in flender loofe fpikes, each hanging downward, of a red colour below, and green at the top. 6. The margaritifera, or pearl aloe, is a very beautiful plant. It is fmaller than moft of the aloe kind. The leaves are fhort, very thick, fharp pointed, and turning down, with a large thick end, appear there triangular. The colour of the leaves is a fine green, ftripped in an elegant manner with white, and frequently tipped with red at the point. The flower-ftalk, which rifes in the midft of the leaves, is round, fmooth, of a purple colour, and generally about eight inches high. When the plant has been properly cultivated, the flowers are ftripped with green and white; and fometimes they are entirely white. This aloe is fingular in not having the bitter refinous juice with which the leaves of moft others abound; when a leaf of this fpecies is cut, what runs from it is watery, colourlefs, and perfectly infipid. 7. The perfoliata, or focotorine aloe, hath long, narrow, fucculent leaves, which come out without any order, and form large heads. The ftalks grow three or four feet high; and have two, three, and fometimes four, of thefe heads branching out from it. The flowers grow in long fpikes, each ftanding on a pretty long footftalk; they are of a bright red colour tipped with green, and generally appear in the winter feafon. 8. The retufa, or cufhion aloe, hath very fhort, thick, fucculent leaves, compreffed on the upper fide like a cufhion. This grows very clofe to the ground; the flowers grow on flender ftalks, and are of an herbaceous colour.

Culture. The proper earth for planting thefe vegetables in, is, one half frefh light earth from a common, and the reft an equal mixture of white fea-fand and fifted lime-rubbifh. This mixture fhould be always made fix or eight months before the plants are to be fet in it. The common aloe will live in a dry green-houfe in winter; and may be placed in the open air in fummer, in a fheltered fituation, but muft have very little water. Moft of the other aloes are beft preferved in an airy glafs-cafe, in which there is a ftove, to make a little fire in very bad weather. The tendereft kinds require a greater fhare of heat to preferve them in winter, and fhould be kept in a good ftove, in a degree of heat ten degrees above temperate. Many other kinds may alfo be kept in this heat; but the greater the heat, the more water they always require. About the beginning of June, it is ufual in England to fet the pots of aloes out of the houfe: but they fhould be fet under the fhelter of hedges or trees, to keep them from the violence of the fun; the rains alfo, which ufually fall in this and the following month, are apt to rot them. It is therefore beft to keep them under cover the greateft part of the year. The beft time to fhift thefe plants is the middle of July. They are, on this occafion, to be taken out of the pots, the loofe earth to be picked from about their roots, and the decayed or mouldy parts of them cut off; then a few ftones are to be put at the bottom of the pot, and it is to be filled with the compofition before defcribed, and the plants carefully put in, the roots being fo difpofed as not to interfere with one another. They are to be carefully watered after this, at times, for three weeks, and fet in a fhady place. The common kind will bear the open air from May to October, and fhould be fhifted every year. All the aloes are propagated by off-fets, or by planting the leaves. The off-fets fhould be taken from the mother plant, at the time when it is fhifted: they are to be planted in very fmall pots of the proper mixed earth; and if that part of them which joined to the mother-plant be obferved to be moift when taken off, it fhould lie on the ground in a fhady place two or three days before it is planted, otherwife it will rot. After planting thefe, they fhould remain in a fhady place a fortnight; and then be removed to a very moderate hot-bed, plunging the pots therein, which will help their ftriking new roots. Towards the end of Auguft they muft be, by degrees, hardened to the open air, by taking off the glaffes of the hot-bed; and in September they may be removed into the green-houfe.

Properties, &c. The *aloe* is a kind of fymbolic plant to the Mahometants, efpecially in Egypt, and in fome meafure dedicated to the offices of religion; for whoever returns from a pilgrimage to Mecca, hangs it over his ftreet-door, as a token of his having performed that holy journey. The fuperftitious Egyptians believe that this plant hinders evil fpirits and apparitions from entering the houfe; and on this account, whoever walks the ftreets in Cairo, will find it over the doors both of Chriftians and Jews. From the fame plant the Egyptians diftil a water, which is fold in the apothecaries fhops at Cairo, and recommended in coughs, hyfterics, and afthmas. An unexperienced French furgeon, fays Haffelquift, gave a Coptite, 40 years old, afflicted with the jaundice, four tea-cups full of the diftilled water of this fpecies of aloe, and cured him in four days. This remedy, unknown to our apothecaries, is not difficult to be obtained, as the plant might eafily be raifed in the warm fouthern parts of Europe. The Arabians call it *fibbara*.

Of the leaves of the Guinea aloe, mentioned by Mr Adanfon in his voyage to Senegal, the negroes make very good ropes, not apt to rot in the water.

Dr Sloane mentions two forts of aloe; one of which is

Aloe.

is used for fishing-lines, bow-strings, stockings, and hammocks; the other has leaves which, like those of the wild-pine and banana, hold rain-water, and thereby afford a very necessary refreshment to travellers in hot countries, where there is generally a scarcity of wells and water.

In Mexico, the *maguei*, a species of aloe, yields almost every thing necessary to the life of the poor. Besides making excellent hedges for their fields, its trunk served in place of beams for the roofs of their houses, and its leaves instead of tiles. From those leaves they obtained paper, thread, needles, clothing, shoes, and stockings, and cordage; and from its copious juice they made wine, honey, sugar, and vinegar. Of the trunk, and thickest part of the leaves, when well baked, they made a very tolerable dish of food. Lastly, it was a powerful medicine in several disorders, and particularly in those of the urine. It is also at present one of the plants the most valued and most profitable to the Spaniards.

The medical substance known by the name of *aloes* is the inspissated juice of some of the abovementioned species. The ancients distinguished two sorts of aloes: the one was pure and of a yellowish colour, inclining to red, resembling the colour of a liver, and thence named *hepatic;* the other was full of impurities, and hence supposed to be only the dross of the better kind. At present, various sorts are met with in the shops; which are distinguished either from the places, from the species of the plants, or from some difference in the juices themselves. These may be all ranged in three classes:

1. *Aloe Perfoliata*, socotorine aloes, brought from the island Socotora in the Indian ocean, wrapt in skins; it is obtained from the 15th species abovementioned.—This sort is the purest of the three: it is of a glossy surface, clear, and in some degree pellucid; in the lump, of a yellowish red colour, with a purple cast; when reduced to powder, of a bright golden colour. It is hard and friable in the winter, somewhat pliable in summer, and grows soft betwixt the fingers. Its taste is bitter, accompanied with an aromatic flavour, but insufficient to prevent its being disagreeable: the smell is not very unpleasant, and somewhat resembles that of myrrh.

2. *Aloe Hepatica*, hepatic, Barbadoes, or common aloes (the juice of a variety of the former), is not so clear and bright as the foregoing sort; it is also of a darker colour, more compact texture, and for the most part drier. Its smell is much stronger and more disagreeable; the taste intensely bitter and nauseous, with little or nothing of the fine aromatic flavour of the socotorine.—The best hepatic aloes come from Barbadoes in large gourd-shells; an inferior sort of it (which is generally soft and clammy) is brought over in casks.

Of the cultivation and preparation of hepatic aloes in the island of Barbadoes, we have the following account in the London Medical Journal*. "The lands in the vicinity of the sea, that is, from two to three miles, which are rather subject to drought than otherwise, and are so stony and shallow as not to admit of the planting of sugar canes with any prospect of success, are generally found to answer best for the aloe plant. The stones, at least the larger ones, are first picked up, and either packed in heaps, upon the most shallow barren spots, or laid round the field as a dry wall. The land is then lightly ploughed, and very carefully cleared of all noxious weeds, lined at one foot distance from row to row, and the young plants set, like cabbages, at about five or six inches from each other. This regular mode of lining and setting the plants is practised only by the most exact planters, in order to facilitate the weeding of them, by hand, very frequently; because, if they are not kept perfectly clean and free from weeds, the produce will be but very small. They will bear being planted in any season of the year, even in the driest, as they will live on the surface of the earth for many weeks without a drop of rain. The most general time, however, of planting them, is from April to June.

* Vol. viii. Art. 8.

"In the March following, the labourers carry a parcel of tubs and jars into the field, and each takes a slip or breadth of it, and begins by laying hold of a bunch of the blades, as much as he can conveniently grasp with one hand, while with the other he cuts it just above the surface of the earth, as quickly as possible (that the juice may not be wasted), and then places the blades in the tub, bunch by bunch, or handful by handful. When the first tub is thus packed quite full, a second is begun (each labourer having two); and by the time the second is filled, all the juice is generally drained out of the blades in the first tub. The blades are then lightly taken out, and thrown over the land by way of manure; and the juice is poured out into a jar. The tub is then filled again with blades, and so alternately till the labourer has produced his jar full, or about four gallons and an half of juice, which is often done in six or seven hours, and he has then the remainder of the day to himself, it being his employer's interest to get each day's operation as quickly done as possible.—It may be observed, that although aloes are often cut in nine, ten, or twelve months after being planted, they are not in perfection till the second and third year; and that they will be productive for a length of time, say 10 or 12 years, or even for a much longer time, if good dung, or manure of any kind, is strewed over the field once in three or four years, or oftener if convenient.

"The aloe juice will keep for several weeks without injury. It is therefore not boiled till a sufficient quantity is procured to make it an object for the boiling-house. In the large way, three boilers, either of iron or of copper, are placed to one fire, though some have but two, and the small planters only one. The boilers are filled with the juice; and, as it ripens or becomes more inspissated, by a constant but regular fire, it is ladled forward from boiler to boiler, and fresh juice is added to that farthest from the fire, till the juice in that nearest to the fire (by much the smallest of the three, and commonly called by the name of *tatch*, as in the manufactory of sugar) becomes of a proper consistency to be skipped or ladled out into gourds, or other small vessels, used for its final reception. The proper time to skip or ladle it out of the tatch, is when it is arrived at what is termed a resin height, or when it cuts freely, or in thin flakes, from the edges of a small wooden slice, that is dipped from time to time into the tatch for that purpose. A little lime-water is used by some aloe-boilers, during the process, when the ebullition is too great.

"As

Aloe.

"As to the fun-dried aloes (which is moft approved for medicinal purpofes), very little is made in Barbadoes. The procefs is, however, very fimple, though extremely tedious. The raw juice is either put into bladders, left quite open at top, and fufpended in the fun, or in broad fhallow trays of wood, pewter, or tin, expofed alfo to the fun, every dry day, until all the fluid parts are exhaled, and a perfect refin formed, which is then packed up for ufe, or for exportation."

The Barbadoes aloes is faid to be common alfo in the other Weft India iflands; and the following account of the manner of preparing it in Jamaica is given by Dr Wright in the fame volume of the Medical Journal, art. 1. "The plant is pulled up by the roots, and carefully cleanfed from the earth or other impurities. It is then fliced and cut in pieces into fmall hand-bafkets or nets. Thefe nets or bafkets are put into large iron boilers with water, and boiled for ten minutes, when they are taken out, and frefh parcels fupplied till the liquor is ftrong and black. At this period the liquor is thrown through a ftrainer into a deep vat, narrow at bottom, to cool, and to depofite its fæculent parts. Next day the clear liquor is drawn off by a cock, and again committed to the large iron veffel. At firft it is boiled brifkly; but towards the end of the evaporation is flow, and requires conftantly ftirring to prevent burning. When it becomes of the confiftence of honey, it is poured into gourds or calabafhes for fale. This hardens by age."

3. *Aloe-Caballina*, fetid, caballine, or horfe-aloes, is fuppofed to be a coarfer fort obtained from the fame fpecies with the foregoing; according to others, it is the produce of the difticha. It is chiefly diftinguifhable by its ftrong rank fmell.

All the different kinds are gum-refins, which contain more gummous than refinous parts. Water, when of a boiling heat, diffolves all the foluble parts of aloes; but if let ftand till it grows cold, it lets drop moft of its refin. A ftrong fpirit diffolves and keeps fufpended almoft the whole of aloes, though it contains fuch a large portion of gummous parts; hence it is evident, that aloes contains fome principle, faline or other, which renders water capable of diffolving refin, and fpirit capable of diffolving gum.

Aloes is a ftimulating ftomachic purge, which, given in fmall quantity, operates mildly by ftool; but in large dofes acts roughly, and often occafions an irritation about the anus, and fometimes a difcharge of blood. It is a good opening medicine to people of a lax habit, or who live a fedentary life; and to thofe whofe ftomach and bowels are loaded with phlegm or mucus, or who are troubled with worms, or are debilitated; becaufe at the fame time that it carries off thofe vifcid humours which pall the appetite, and overload the inteftines, it ferves as a ftrengthener and bracer. In fmall dofes, repeated from time to time, it not only cleanfes the primæ viæ, but likewife tends to promote the menftrual difcharge in women; and therefore it is frequently employed in chlorofis, or where the menftrua are obftructed. It is a good ftomachic purge, and is given in all cafes where fuch a one is wanted; but it is looked upon as a heating medicine, and not proper in bilious habits, or where there is much heat or fever; and its continued ufe is apt to bring on the piles.

It is given in fubftance from five grains to a fcruple, though formerly it ufed to be prefcribed in dofes of two or three times that quantity; but thefe large dofes fometimes brought on troublefome fymptoms. As it is a flow working purge, it is generally taken at bedtime, and it operates next day.

Aloe || Aloof.

With regard to this, as well as all other refinous purges, it ought to be obferved, that when they are given in fubftance without any mixture, they are apt to adhere to the coats of the inteftines, and to occafion griping and uneafinefs; for thefe reafons aloes is generally mixed with fome faponaceous or refolvent body, to deftroy its vifcid tenacity, before it is given in fubftance. The fubftances which are moft ufed for this purpofe are, a fmall quantity of the fixt alkaline falts; foap; the yolk of an egg; and gummous vegetable extracts. Mr Barton alleges*, that by triturating aloes with a fmall quantity of alkaline falts, its tenacity was more effectually deftroyed than by any other thing he tried: that Caftile foap and the yolk of an egg anfwered beft, next to it; that manna, fugar, and honey, were far inferior to them; and that gummous, or mucous vegetable extracts, fuch as the extracts of gentian, or of liquorice root, triturated with the aloes, in the proportion of one part of the extract to two of the aloes, and then made up into pills with a fufficient quantity of fyrup, deftroyed the vifcidity of the aloes, and rendered its operation mild.

* *Treatife of the Manufacture of Drugs*, 1747.

Socotorine aloes contains more gummy matter than the hepatic; and hence it is likewife found to purge more, and with greater irritation. The firft fort therefore is moft proper where a ftimulus is required, as for promoting or exciting the menftrual flux; whilft the latter is better calculated to act as a common purge. For the aloetic preparations, fee PHARMACY. *Index*.

Aloes-Wood. See *Xylo-Aloes*.

American Aloe. See AGAVE.

ALOGIANS, in church-hiftory, a fect of ancient heretics, who denied that Jefus Chrift was the Logos, and confequently rejected the gofpel of St John—The word is compounded of the privative α, and λογος, q. d. *without Logos* or *Word*.—Some afcribe the origin of the name, as well as of the fect of Alogians, to Theodore of Byzantium, by trade a currier; who having apoftatized under the perfecution of the emperor Severus, to defend himfelf againft thofe who reproached him therewith, faid, that it was not God he denied, but only man. Whence his followers were called in Greek αλογοι, becaufe they rejected the Word. But others, with more probability, fuppofe the name to have been firft given them by Epiphanius in the way of reproach. They made their appearance toward the clofe of the fecond century.

ALOGOTROPHIA, among phyficians, a term fignifying the unequal growth or nourifhment of any part of the body, as in the rickets.

ALOOF, has frequently been mentioned as a fea-term; but whether juftly or not, we fhall not prefume to determine. It is known in common difcourfe to imply *at a diftance;* and the refemblance of the phrafes *keep a loof*, and *keep a luff*, or *keep the luff*, in all probability gave rife to this conjecture. If it was really a fea-phrafe originally, it feems to have referred to the dangers of a lee-fhore, in which fituation the pilot might naturally apply it in the fenfe commonly underftood, viz. keep *all off*, or quite off: it is, however, never expreffed in that

Alopece || Aloft.

that manner by feamen now. See Luff. It may not be improper to obferve, that befides ufing this phrafe in the fame fenfe with us, the French alfo call the weather-fide of a fhip, and the weather-clue of a courfe, *le lof*.

ALOPECE, Alopecia (anc. geog.), an ifland placed by Ptolemy at the mouth of the Tanais, and called the ifland *Tanais*: now *l'Ifle des Renards* (Baudrand). Alfo an ifland of the Bofporus Cimmerius (Pliny); and another in the Egean fea, over-againft Smyrna.

ALOPECIA, a term ufed among phyficians to denote a total falling off of the hair from certain parts, occafioned either by the defect of nutritious juice, or by its vicious quality corroding the roots of it, and leaving the fkin rough and colourlefs.

The word is formed from αλωπηξ, *vulpes*, "a fox;" whofe urine, it is faid, will occafion baldnefs; or becaufe it is a difeafe which is common to that creature. It is directed to wafh the head every night at going to bed with a ley prepared by boiling the afhes of vine branches in red wine. A powder made by reducing hermodactyls to fine flour, is alfo recommended for the fame purpofe.

In cafes where the baldnefs is total, a quantity of the fineft burdock roots are to be bruifed in a marble mortar, and then boiled in white wine until there remains only as much as will cover them. This liquor, carefully ftrained off, is faid to cure baldnefs, by wafhing the head every night with fome of it warm. A ley made by boiling afhes of vine branches in common water, is alfo recommended with this intention. A frefh cut onion, rubbed on the part until it be red and itch, is likewife faid to cure baldnefs.

A multitude of fuch remedies are every where to be found in the works of Valefcus de Taranta, Rondeletius, Hollerius, Trincavellius, Celfus, Senertay, and other practical phyficians. See alfo Buxus.

ALOPECURUS, or Fox-tail grass, in botany: A genus of the triandria digynia clafs; and in the natural method ranking under the 4th order, *Gramina*. The characters are: The *calyx* is a fingle-flower'd bivalve glume: The *corolla* is one-valved: The *ftamina* confift of three capillary filaments; the antheræ bifurcated at both ends: The *piftillum* is a roundifh germen; there are two ftyli; and the ftigmata are fimple: The *pericarpium* is a corolla cloathing the feed; and the *feed* is fingle and roundifh. There are eight fpecies, viz. the pratenfis, or meadow fox-tail grafs; the bulbofus, or bulbous fox-tail grafs; the geniculatus, or flote fox-tail grafs; and the myofuroides, or field fox-tail grafs; thefe four grow wild in Britain: the agreftis, the monfpelienfis, the paniceus, and the hordeiformis, are all natives of France and the fouthern parts of Europe, except the laft, which is a native of India. See Grass.

ALOPEX, in zoology, a fpecies of the canis, with a ftrait tail and black tip. It is commonly called the *field fox*.

ALOSA, the fhad, or mother of herrings, a fpecies of the clupea. See Clupea.

ALOST, a town in Flanders, belonging to the houfe of Auftria, feated on the river Dender, in the midway between Bruffels and Ghent. It has but one parifh; but the church is collegiate, and has a provoft, a dean, and twelve canons. Here is a convent of Carmelites, another of capuchines, another of bare-footed Carmelites, three nunneries, an hofpital, and a convent of Guillemins, in which is the tomb of Theodore Martin, who brought the art of printing out of Germany into the Low Countries. He was a friend of Erafmus, who wrote his epitaph. E. Long. 4. 10. N. Lat. 49. 55.

Alpha, Alphabet.

ALPHA, the name of the firft letter of the Greek alphabet, anfwering to our A.—As a numeral, it ftands for one, or the firft of any thing. It is particularly ufed, among ancient writers, to denote the chief or firft man of his clafs or rank. In this fenfe, the word ftands contradiftinguifhed from *beta*, which denotes the fecond perfon. Plato was called the *Alpha* of the wits: Eratofthenes, keeper of the Alexandrian library, whom fome called a Second Plato, is frequently named *Beta*.

Alpha is alfo ufed to denote the beginning of any thing. In which fenfe it ftands oppofed to *omega*, which denotes the end. And thefe two letters were made the fymbol of Chriftianity; and accordingly were engraven on the tombs of the ancient Chriftians, to diftinguifh them from thofe of idolaters. Moralez, a Spanifh writer, imagined that this cuftom only commenced fince the rife of Arianifm; and that it was peculiar to the orthodox, who hereby made confeffion of the eternity of Chrift: but there are tombs prior to the age of Conftantine whereon the two letters were found, befides that the emperor juft mentioned bore them on his labarum before Arius appeared.

ALPHABET, the natural or cuftomary feries of the feveral letters of a language (fee Language and Writing). The word is formed from *alpha* and *beta*, the firft and fecond letters of the Greek alphabet. The number of letters is different in the alphabets of different languages. The Englifh alphabet contains 24 letters; to which if we add *j* and *v* confonant, the fum will be 26: the French contains 23; the Hebrew, Chaldee, Syriac, and Samaritan, 22 each; the Arabic 28; the Perfian 31; the Turkifh 33; the Georgian 36; the Coptic 32; the Mufcovite 43; the Greek 24; the Latin 22; the Sclavonic 27; the Dutch 26; the Spanifh 27; the Italian 20; the Ethiopic and Tartarian, each 202; the Indians of Bengal 21; the Baramefe 19. The Chinefe have, properly fpeaking, no alphabet, except we call their whole language by that name; their letters are words, or rather hieroglyphics, amounting to about 80,000.

It has been a matter of confiderable difpute whether the method of expreffing our ideas by vifible fymbols, called *letters*, be really a human invention; or whether we ought to attribute an art fo exceedingly ufeful, to an immediate revelation from the Deity.—In favour of the latter opinion it has been urged,

1 Arguments for writing being a divine revelation.

1. The five books of Mofes are univerfally acknowledged to be the moft ancient compofitions as well as the moft early fpecimens of alphabetical writing we have. If, therefore, we fuppofe writing to be the refult of human ingenuity, it muft be different from all other arts, having been brought to perfection at once; as it feems impoffible to make any real improvement on the Hebrew alphabet. It may indeed be replied, that alphabetical characters perhaps have exifted many ages before the writings of Mofes, though the more ancient fpecimens have perifhed. This, however, being a mere

Alphabet. mere unfupported affertion, without any hiftorical teftimony to corroborate it, cannot be admitted as a proof. Again, fetting afide the evidence to be derived from Scripture on this fubject, the fimplicity of manners predominant in the early ages, the fmall extent of the intellectual powers of mankind, and the little intercourfe which nations had with one another, which would feem more particularly to render writing neceffary, can fcarce allow us to fuppofe that fuch a complex and curious contrivance as alphabetical writing could be invented by a race of men whofe wants were fo few, their advantages fo circumfcribed, and their ideas fo limited.

2. If alphabetical writing were a mere human invention, it might be expected that different nations would have fallen upon the fame expedient independent of each other during the compafs of fo many ages. But no fuch thing has taken place; and the writing of every people on earth may be referred to one common original. If this can be proved, the argument from fucceffive derivation, without a fingle inftance of independent difcovery, muft be allowed to amount to the very higheft degree of probability in favour of our hypothefis, which will now reft on the evidence for or againft this fact; and which may be fummed up in the following manner.

Among the European nations we find none who can pretend any right to the difcovery of letters. All of them derived the art from the Romans, excepting only the Turks, who had it from the Arabians. The Romans never laid claim to the difcovery; but confeffed that they derived their knowledge from the Greeks, and the latter owned that they had it from the Phœnicians; who, as well as their colonifts the Carthaginians, fpoke a dialect of the Hebrew fcarcely varying from the original. The Coptic, or Egyptian, refembles the Greek in moft of its characters, and is therefore to be referred to the fame original. The Chaldee, Syriac, and latter Samaritan, are dialects of the Hebrew, without any confiderable deviation, or many additional words. The Ethiopic differs more from the Hebrew, but lefs than the Arabic; yet thefe languages have all iffued from the fame ftock, as the fimilarity of their formation, and the numberlefs words common to them, all fufficiently evince; and the Perfic is very nearly allied to the Arabic. Alterations indeed would naturally be produced, in proportion to the civilization of the feveral nations, and their intercourfe with others; which will account for the fuperior copioufnefs of fome above the reft. It appears then, that all the languages in ufe amongft men that have been conveyed in alphabetical characters, have been the languages of people connected ultimately or immediately with the Hebrews, who have handed down the earlieft fpecimens of writing to pofterity; and we have therefore the greateft reafon to believe, that their method of writing, as well as their language, was derived from the fame fource.

This propofition will be farther confirmed from confidering the famenefs of the artificial denominations of the letters in the Oriental, Greek, and Latin languages, accompanied alfo by a fimilar arrangement, as *alpha*, *beta*, &c. It may ftill be objected, however, that the characters employed by the ancients to difcriminate their letters are entirely diffimilar. Why fhould not one nation, it may be urged, adopt from the other the mode of expreffing the art as well as the art itfelf? To what purpofe did they take the trouble of inventing other characters? To this objection it may be replied, 1. From the inftance of our own language we know what diverfities may be introduced in this refpect merely by length of time and an intercourfe with neighbouring nations. And fuch an effect would be more likely to take place before the art of printing had contributed to eftablifh an uniformity of character: For when every work was tranfcribed by the hand, we may eafily imagine how many variations would arife from the fancy of the fcribe, and the mode of writing fo conftantly different in individuals. 2. This diverfity might fometimes arife from vanity. When an individual of another community had become acquainted with this wonderful art, he might endeavour to recommend himfelf as the inventor; and, to avoid detection, might invent other characters. 3. The characters of the alphabet might fometimes be accommodated as much as poffible to the fymbolical marks already in ufe amongft a particular people. Thefe having acquired a high degree of fanctity by the ufe of many generations, would not be eafily fuperfeded without the aid of fome fuch contrivance. 4. This is fupported by the teftimony of Herodotus; who informs us, that "thofe Phœnicians who came with Cadmus introduced many improvements among the Greeks, and alphabetical writing too, not known among them before that period. At firft they ufed the Phœnician character; but in procefs of time, as the pronunciation altered, the ftandard of the letters was alfo changed. The Ionian Greeks inhabited at that time the parts adjacent to Phœnicia: who having received the art of alphabetical writing from the Phœnicians, ufed it, with an alteration of fome few characters, and confeffed ingenuoufly, that it was called Phœnician from the introducers of it." He tells us that he had himfelf feen the characters of Cadmus in a temple of Ifmenian Apollo at Thebes in Bœotia, engraven upon tripods, and very much refembling the Ionian characters. 5. The old Samaritan is precifely the fame as the Hebrew language; and the Samaritan Pentateuch does not vary by a fingle letter in twenty words from the Hebrew: but the characters are widely different: for the Jews adopted the Chaldaic letters during their captivity at Babylon, inftead of the characters of their forefathers.

3. What we know of thofe nations who have continued for many centuries unconnected with the reft of the world, ftrongly militates againft the hypothefis of the human invention of alphabetical writing. The experiment has been fairly made upon the ingenuity of mankind for a longer period than that which is fuppofed to have produced alphabetical writing by regular gradations; and this experiment determines peremptorily in their favour. The Chinefe, a people famous for their difcoveries and mechanical turn of genius, have made fome advances towards the delineation of their ideas by arbitrary figns; but have neverthelefs been unable to accomplifh this exquifite device; and after fo long a trial to no purpofe, we may reafonably infer, that their mode of writing, which is growing more intricate and voluminous every day, would never terminate in fo clear, fo comparatively fimple,

Alphabet. ſimple, an expedient as that of alphabetical characters. The Mexicans, too, had made ſome rude attempts of the ſame kind; but with leſs ſucceſs than the Chineſe. We know alſo, that hieroglyphics were in uſe among the Egyptians poſterior to the practice of alphabetical writing by the Jews; but whether the epiſtolography, as it is called, of the former people, which was in vogue during the continuance of the hieroglyphics, might not poſſibly be another name for alphabetical writing, cannot be decided.

4. We ſhall conſider the argument on which the commonly received ſuppoſition entirely depends: that is, the natural gradation through the ſeveral ſpecies of ſymbols acknowledged to have been in uſe with various people, terminating at laſt by an eaſy tranſition, in the detection of alphabetical characters. The ſtrength of this argument will be beſt underſtood from the following repreſentation.

"1. The firſt method of embodying ideas would be by drawing a repreſentation of the objects themſelves. The imperfection of this method is very obvious, both on account of its tedioufneſs and its inability of going beyond external appearances to the abſtract ideas of the mind.

"2. The next method would be ſomewhat more general, and would ſubſtitute two or three principal circumſtances for the whole tranſaction. So two kings, for example, engaging each other with military weapons, might ſerve to convey the idea of a war between the two nations. This abbreviated method would be more expeditious than the former; but what it gained in conciſeneſs would be loſt in perſpicuity. It is a deſcription more compendious indeed, but ſtill a deſcription of outward objects alone, by drawing their reſemblance. To this head may be referred the picture-writing of the Mexicans.

"3. The next advance would be to the uſe of ſymbols: the incorporation, as it were, of abſtract and complex ideas in figures more or leſs generalized, in proportion to the improvement of it. Thus, in the earlier ſtages of this device, a circle might ſerve to expreſs the ſun, a ſemicircle the moon; which is only a contraction of the foregoing method. This ſymbol-writing in its advanced ſtate would become more refined, but enigmatical and myſterious in proportion to its refinement. Hence it would become leſs fit for common uſe; and therefore more particularly appropriated to the myſteries of philoſophy and religion. Thus, two feet ſtanding upon water ſerved to expreſs an impoſſibility; a ſerpent denoted the oblique trajectories of the heavenly bodies; and the beetle, on account of ſome ſuppoſed properties of that inſect, ſerved to repreſent the ſun. The Egyptian hieroglyphics were of this kind.

"4. This method being ſtill too ſubtile and complicated for common uſe, the only plan to be purſued was a reduction of the firſt ſtage of the preceding method. Thus a dot, inſtead of a circle, might ſtand for the ſun; and a ſimilar abbreviation might be extended to all the ſymbols. On this ſcheme every object and idea would have its appropriated mark: theſe marks therefore would have a multiplicity proportionable to the works of nature and the operations of the mind. This method was likewiſe practiſed by the Egyptians; but has been carried to greater perfection by the Chineſe. The vocabulary of the latter is therefore infinite, or at leaſt capable of being extended to any imaginable length. But if we compare this tedious and aukward contrivance with the aſtoniſhing brevity and perſpicuity of alphabetical writing, we muſt be perſuaded that no two things can be more diſſimilar; and that the tranſition from a ſcheme conſtantly enlarging itſelf, and growing daily more intricate, to the expreſſion of every poſſible idea by the modified arrangement of four-and-twenty marks, is not ſo very eaſy and perceptible as ſome have imagined. Indeed this ſeems ſtill to be rather an expreſſion of things in a manner ſimilar to the ſecond ſtage of ſymbol-writing than the notification of ideas by arbitrary ſigns."

2 Additional remarks in confirmation of theſe arguments.

To all this we ſhall ſubjoin the following remarks, which ſeem to give additional force to the foregoing reaſoning.

"1. Pliny aſſerts the uſe of letters to have been eternal; which ſhows the antiquity of the practice to extend beyond the æra of authentic hiſtory.

"2. The cabaliſtical doctors of the Jews maintain, that alphabetical writing was one of the ten things which God created on the evening of the Sabbath.

"3. Moſt of the profane authors of antiquity aſcribe the firſt uſe of alphabetical characters to the Egyptians; who, according to ſome, received them from Mercury; and, according to others, from their god Teuth.

"4. There is very little reaſon to ſuppoſe that even language itſelf is the effect of human ingenuity and invention."

3 Anſwers to the above arguments.

Thus we have ſtated the arguments in favour of the revelation of alphabetical writing; which are anſwered, by thoſe who take the contrary ſide, in the following manner.

1. Moſes no where ſays that the alphabet was a new thing in his time; nor does he give the leaſt hint of his being the inventor of it. The firſt mention we find of *writing* is in the 17th chapter of Exodus; where Moſes is commanded to *write in a book;* and which took place before the arrival of the Iſraelites at Sinai. This ſhows that writing did not commence with the delivery of the two tables of the law, as ſome have ſuppoſed. Neither are we to conclude that the invention had taken place only a ſhort time before; for the *writing in a book* is commanded as a thing commonly underſtood, and with which Moſes was well acquainted. It is plain, from the command to engrave the names of the twelve tribes of Iſrael upon ſtones *like the engravings of a ſignet,* that writing had been known and practiſed among them, as well as other nations, long before. We muſt alſo remember, that the people were commanded to write the law on their door-poſts, &c. ſo that the art ſeems not only to have been known, but univerſally practiſed among them. But had writing been a new diſcovery in the time of Moſes, he would probably have commemorated it as well as the other inventions of muſic, &c.: Nor is there any reaſon to ſuppoſe that God was the immediate revealer of the art; for Moſes would never have omitted to record a circumſtance of ſuch importance, as the memory of it would have been one of the ſtrongeſt barriers againſt idolatry.

Again,

Again, though ſeveral profane writers attribute the origin of letters to the gods, or to ſome divine perſon, yet this is no proof of its being actually revealed; but only that the original inventor was unknown. The learned biſhop of Glouceſter obſerves, that the ancients gave nothing to the gods of whoſe original they had any records; but where the memory of the invention was loſt, as of ſeed-corn, wine, writing, civil ſociety, &c. the gods ſeized the property, by that kind of right which gives ſtrays to the lord of the manor.

As neither the ſacred nor profane hiſtorians, therefore, have determined any thing concerning the invention of letters, we are at liberty to form what conjectures we think moſt plauſible concerning the origin of them; and this, it is thought, might have taken place in the following manner.

"1. Men, in their rude uncultivated ſtate, would have neither leiſure, inclination, nor inducement, to cultivate the powers of the mind to a degree ſufficient for the formation of an alphabet: but when a people arrived at ſuch a pitch of civilization as required them to repreſent the conceptions of the mind which have no corporeal forms, neceſſity would occaſion further exertions, and urge them to find out a more expeditious manner of tranſacting their buſineſs than by picture-writing.

"2. Theſe exertions would take place whenever a nation began to improve in arts, manufactures, and commerce; and the greater genius ſuch a nation had, the more improvements would be made in the notation of their language; whilſt thoſe people who had made leſs progreſs in civilization and ſcience, would have a leſs perfect ſyſtem of elementary characters; and perhaps advance no farther for many ages than the marks or characters of the Chineſe. Hence we may ſee, that the buſineſs of princes, as well as the manufactures and commerce of each country, would produce the neceſſity of deviſing ſome expeditious manner of communicating information to one another."

The art of writing, however, is of ſo great antiquity, and the early hiſtory of moſt nations ſo full of fable, that it muſt be extremely difficult to determine what nation or people may juſtly claim the honour of the invention. But as it is probable that letters were the produce of a certain degree of civilization among mankind, we muſt therefore have recourſe to the hiſtory of thoſe nations who ſeem to have been firſt civilized.

4 Claim of the Egyptians to the invention of letters.

The Egyptians have an undoubted title to a very early civilization; and many learned men have attributed the invention of letters to them. The late biſhop of Glouceſter contends, that Egypt was the parent of all the learning of Greece, and was reſorted to by all the Grecian legiſlators, naturaliſts, and philoſophers; and endeavours to prove that it was one of the firſt civilized countries on the globe. Their writing was of four kinds: 1. *Hieroglyphic*; 2. *Symbolic*; 3. *Epiſtolic*; and, 4. *Hierogrammatic*. In the moſt early ages they wrote like all other infant nations, by pictures; of which ſome traces yet remain amongſt the hieroglyphics of Horapollo, who informs us, that they repreſented a *fuller* by a man's two feet in water; *fire*, by ſmoke aſcending, &c. But to render this rude invention leſs incommodious, they ſoon deviſed the method of putting one thing of ſimilar qualities for another. The former was called the *curiologic*, the latter the *tropical* hieroglyphic; which laſt was a gradual improvement on the former. Theſe alterations in the manner of delineating hieroglyphic figures produced and perfected another character, called the *running-hand of the hieroglyphics*, reſembling the Chineſe writing; which having been firſt formed by the outlines of each figure, became at length a kind of *marks*; the natural effects of which were, that the conſtant uſe of them would take off the attention from the ſymbol and fix it on the thing ſignified. Thus the ſtudy of ſymbolic writing would be much abbreviated; becauſe the writer or decypherer would have then little to do but to remember the power of the ſymbolic mark; whereas before, the properties of the thing or animal delineated were to be learned. This, together with the other marks by inſtitution, to denote mental conceptions, would reduce the characters to a ſimilar ſtate with the preſent Chineſe; and theſe were properly what the ancients called *hieroglyphical*. We are informed by Dr Robert Huntingdon, in his account of the Porphyry pillars, that there are ſome ancient monuments of this kind yet remaining in Egypt.

The ſacred book or ritual of the Egyptians, according to Apuleius, was written partly in ſymbolic and partly in theſe hieroglyphic characters, in the following manner: "He (the hierophant) drew out certain books from the ſecret repoſitories of the ſanctuary, written in unknown characters, which contained the words of the ſacred formula compendiouſly expreſſed, partly by figures of animals, and partly by certain marks or notes intricately knotted, revolving in the manner of a wheel, crowded together, and curled inward like the tendrils of a vine, ſo as to hide the meaning from the curioſity of the profane."

5 Letters not invented in Egypt.

But though letters were of great antiquity in Egypt, there is reaſon to believe that they were not firſt invented in that country. Mr Jackſon, in his Chronological Antiquities, has endeavoured to prove, that they were not invented or carried into Egypt by *Taaut* or *Thoth*, the firſt Hermes, and ſon of Miſraim, who lived about 500 years after the deluge; but that they were introduced into that country by the ſecond Hermes, who lived about 400 years after the former. This ſecond Hermes, according to Diodorus, was the inventor of grammar and muſic, and added many words to the Egyptian language. According to the ſame author alſo, he invented letters, rythm, and the harmony of ſounds. This was the Hermes ſo much celebrated by the Greeks, who knew no other than himſelf. On the other hand, Mr Wiſe aſſerts that Moſes and Cadmus could not learn the alphabet in Egypt; and that the Egyptians had no alphabet in their time. He adduces ſeveral reaſons to prove that they had none till they received what is called the *Coptic*, which was introduced either in the time of the Ptolemies or under Piammitichus or Amaſis; and the oldeſt alphabetic letters which can be produced as Egyptian, appear plainly to have been derived from the Greek. Herodotus confeſſes, that all he relates before the reign of Pſammitichus is uncertain; and that he reports the early tranſactions of that nation on the credit of the Egyptian prieſts, on which he did not greatly depend; and Diodorus Siculus is ſaid to have been greatly impoſed upon by them. Manetho, the oldeſt Egyptian hiſtorian, tranſlated

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translated the sacred registers out of Egyptian into Greek, which are said by Syncellus to have been written in the sacred letters, and to have been laid up by the second Mercury in the Egyptian temples. He allows the Egyptian gods to have been mortal men; but his history was very much corrupted by the Greeks, and hath been called in question by several writers from the account which he himself gave of it. After Cambyses had carried away the Egyptian records, the priests, to supply their loss, and to keep up their pretensions to antiquity, began to write new records; wherein they not only unavoidably made great mistakes, but added much of their own invention, especially as to distant times.

6 Claim of the Phœnicians.

The Phœnicians have likewise been supposed the inventors of letters; and we have the strongest proofs of the early civilization of this people. Their most ancient historian, Sanchoniatho, lived in the time of Abibalus, father of Hiram king of Tyre. He informs us, that letters were invented by *Taaut*, who lived in Phœnicia in the 12th and 13th generations after the creation. "Misor (says he) was the son of Hamyn; the son of Misor was *Taaut*, who invented the first letters for writing." The Egyptians call him *Thoth*; the Alexandrians *Thoyth*; and the Greeks *Hermes*, or *Mercury*. In the time of this Taaut or Mercury (the grandson of Ham the son of Noah), Phœnicia and the adjacent country was governed by Uranus, and after him by his son Saturn or Cronus. He invented letters either in the reign of Uranus or Cronus; and staid in Phœnicia with Cronus till the 32d year of his reign. Cronus, after the death of his father Uranus, made several settlements of his family, and travelled into other parts; and when he came to the south country, he gave all Egypt to the god Taautus, that it should be his kingdom. Sanchoniatho began his history with the creation, and ended it with placing Taautus on the throne of Egypt. He does not mention the deluge, but makes two more generations in Cain's line from Protagonus to Agrovenus (or from Adam to Noah) than Moses. As Sanchoniatho has not told us whether Taaut invented letters either in the reign of Uranus or Cronus, "we cannot err much (says Mr Jackson) if we place his invention of them 550 years after the flood, or 20 years after the dispersion, and 2619 years before the Christian æra, and six, or perhaps ten years, before he went into Egypt." This prince and his posterity reigned at Thebes in Upper Egypt for 15 generations.

Several Roman authors attribute the invention of letters to the Phœnicians. Pliny says (A), the Phœnicians were famed for the invention of letters, as well as for astronomical observations and novel and martial arts. Curtius informs us, that the Tyrian nation are related to be the first who either taught or learned letters; and Lucan says, that they were the first who attempted to express sounds or words by letters. Eusebius also tells us from Porphyry, that "Sanchoniatho studied with great application the writings of Taaut, knowing that he was the first who invented letters."

The Greeks, as we have already observed, knew no older Hermes than the second, who lived about 400 years after the Mezrite Taaut or Hermes. This second Hermes is called by Plato *Theuth*, and counsellor or sacred scribe to king Thanius; but it is not said that he ever reigned in Egypt: but the former Taaut, or Athothes, as Monetho calls him, was the immediate successor of Menes the first king of Egypt. This second Mercury, if we may believe Manetho, composed several books of the Egyptian history; and having improved both the language and letters of that nation, the Egyptians attributed the arts and inventions of the former to the latter. The Phœnician language is generally allowed to have been a dialect of the Hebrew; and tho' their alphabet does not entirely agree with the Samaritan, yet there is a great similarity between them. Astronomy and arithmetic were much cultivated among them in the most early ages; their fine linen, purple, and glass, were much superior to those of other nations; and their extraordinary skill in architecture and other arts was such, that whatever was great, elegant, or pleasing, whether in buildings, apparel, or toys, was distinguished by the epithet of Tyrian or Sidonian; these being the chief cities of Phœnicia. Their great proficiency in learning and arts of all kinds, together with their engrossing all the commerce of the western world, are likewise thought to give them a just claim to the invention of letters.

7 Of the Chaldeans.

The Chaldeans also have laid claim to the invention of letters; and with regard to this, there is a tradition among the Jews, Indians, and Arabians, that the Egyptians derived their knowledge from Abraham, who was a Chaldean. This tradition is in some degree confirmed by most of the western writers, who ascribe the inventions of arithmetic and astronomy to the Chaldeans. Josephus positively asserts, that the Egyptians were ignorant of the sciences of arithmetic and astronomy before they were instructed by Abraham; and Sir Isaac Newton admits, that letters were known in the line of that patriarch for many centuries before Moses. The Chaldaic letters appear to have been derived from the Hebrew or Samaritan; which are the same, or nearly so, with the old Phœnician. Ezra is supposed to have exchanged the old Hebrew characters for the more beautiful and commodious Chaldee, which are still in use. Berosus, the most ancient Chaldean historian, who was born in the minority of Alexander the Great, does not say that he believed his countrymen to have been the inventors of letters.

8 Of the Syrians.

The Syrians have also laid claim to the invention of letters. It is certain, indeed, that they yielded to no nation in knowledge and skill in the fine arts. Their language is said to have been the vernacular of all the oriental tongues, and was divided into three dialects. 1. The Aramean, used in Mesopotamia, and by the inhabitants of Roha and Edesa of Harram, and the Outer Syria. 2. The dialect of Palestine; spoken by the inhabitants of Damascus, Mount Libanus, and the Inner Syria. 3. The Chaldee or Nabathean dialect, the most unpolished of the three; and spoken in the mountainous parts of Assyria, and the villages of Irac

(A) See above, n° 2. where he says that the knowledge of letters was eternal. What dependence can we put in the testimony of such a writer?

Alphabet.

Irac or Babylonia. It has been generally believed, that no nation of equal antiquity had a more confiderable trade than the Syrians: they are fuppofed to have firft brought the commodities of Perfia and India into the weft of Afia; and they feem to have carried on an inland trade by engroffing the navigation of the Euphrates, whilft the Phœnicians traded to the moft diftant countries. Notwithftanding thefe circumftances, however, which might feem to favour the claim of the Syrians, the oldeft characters they have are but about three centuries before Chrift. Their letters are of two forts. 1. The Eftrangelo, which is the more ancient; and, 2. The Fſhito, the fimple or common character, which is the more expeditious and beautiful.

9 Of the Indians.

We muft next examine the claims of the Indians, whofe pretenfions to antiquity yield to no other nation on earth. Mr Halhed, who has written a grammar of the Shanfcrit language, informs us, that it is not only the grand fource of Indian literature, but the parent of almoft every dialect from the Perfian gulph to the Chinefe feas, and which is faid to be a language of the moft venerable antiquity. At prefent it is appropriated to religious records of the Bramins, and therefore fhut up in their libraries; but formerly it appears to have been current over the greateft part of the eaftern world, as traces of its extent may be found in almoft every diftrict of Afia.

Mr Halhed informs us, that "there is a great fimilarity between the Shanfcrit words and thofe of the Perfian and Arabic, and even of Latin and Greek; and thefe not in technical or metaphorical terms, but in the main ground-works of language; in monofyllables, the names of numbers, and the appellations of fuch things as would be firft difcriminated on the immediate dawn of civilization. The refemblance which may be feen of the characters on the medals and fignets of different parts of Afia, the light they reciprocally throw upon one another, and the general analogy which they all bear to the grand prototype, affords another ample field for curiofity. The coins of Affam, Napaul, Cafhmiria, and many other kingdoms, are all ftamped with Shanfcrit letters, and moftly contain allufions to the old Shanfcrit mythology. The fame conformity may be obferved in the impreffions of feals from Bootan and Thibet."

The country between the Indus and Ganges ftill preferves the Shanfcrit language in its original purity, and offers a great number of books to the perufal of the curious; many of which have been handed down from the earlieft periods of human civilization.

There are feven different forts of Indian hand-writings, all comprifed under the general term of *Naagoree*, which may be interpreted *writing*. The Bramins fay that letters were of divine original; and the elegant Shanfcrit is ftyled *Daeb-naagoree*, or the writings of the Immortals, which might not improbably be a refinement from the more fimple *Naagoree* of former ages. The Bengal letters are another branch of the fame ftock. The Bramins of Bengal have all their Shanfcrit books copied in their national alphabet, and they tranfpofe into them all the Daeb-naagoree manufcripts for their own perufal. The Moorifh dialect is that fpecies of Hindoftanic which we owe to the conquefts of the Mahometans.

The Shanfcrit language contains about 700 radical words; the fundamental part being being divided into three claffes, viz. 1. *Dhaat*, or roots of verbs; 2. *Shubd*, or original nouns; 3. *Evya*, or particles. Their alphabet contains 50 letters; viz. 34 confonants and 16 vowels. They affert that they were in poffeffion of letters before any other nation in the world; and Mr Halhed conjectures, that the long-boafted original civilization of the Egyptians may ftill be a matter of difpute. The Rajah of Kifhinagur affirms, that he has in his poffeffion Shanfcrit books, where the Egyptians are conftantly defcribed as difciples, not as inftructors; and as feeking in Hindoftan that liberal education, and thofe fciences, which none of their own countrymen had fufficient knowledge to impart. Mr Halhed hints alfo, that the learning of Hindoftan might have been tranfplanted into Egypt, and thus have become familiar to Mofes. Several authors, however, are of opinion, that the ancient Egyptians poffeffed themfelves of the trade of the Eaft by the Red Sea, and that they carried on a confiderable traffic with the Indian nations before the time of Sefoftris; whom they fuppofe to have been cotemporary with Abraham, though Sir Ifaac Newton conjectures him to have been the Shifhak who took Jerufalem in the time of Rehoboam.

In the year 1769, one of the facred books of the Gentoos called *Bagavadam*, tranflated by Meridas Poule, a learned man of Indian origin, and chief interpreter to the fupreme council of Pondicherry, was fent by him to M. Bertin in France. In his preface he fays, that it was compofed by Viaffer the fon of Brahma, and is of facred authority among the worfhippers of Vifchnow. This book claims an antiquity of 5000 years; but M. de Guines has fhown, that its pretenfions to fuch extravagant antiquity are entirely inconclufive and unfatisfactory: whence we may conclude, fays Mr Aftle, that though a farther inquiry into the literature of the Indian nations may be laudable, yet we muft by no means give too eafy credit to their relations concerning the high antiquity of their manufcripts and early civilization.

10 Letters not invented in Perfia;

It is not pretended that the Perfians had any great learning among them till the time of Hyftafpes the father of Darius. The former, we are told, travelled into India, and was inftructed by the Bramins in the fciences for which they were famed at that time. The ancient Perfians defpifed riches and commerce, nor had they any money among them till after the conqueft of Lydia. It appears by feveral infcriptions taken from the ruins of the palace of Perfepolis, which was built near 700 years before the Chriftian æra, that the Perfians fometimes wrote in perpendicular columns like the Chinefe. This mode of writing was firft made ufe of on the ftems of trees, pillars, or obelifks. As for thofe fimple characters found on the weft fide of the ftair-cafe of Perfepolis, fome have fuppofed them to be alphabetic, fome hieroglyphic, and others antediluvian. Dr Hyde pronounces them to have been mere whimfical ornaments, though the author of Conjectural Obfervations on Alphabetic Writing fuppofes them to be fragments of Egyptian antiquity brought by Cambyfes from the fpoils of Thebes. The learned are generally agreed, that the Perfians were later in civilization than many of their neighbours; and they are not fuppofed to have any pretenfions to the invention of letters.

As the Arabians have been in poffeffion of the country

Alphabet. try they now inhabit for upwards of 3700 years, without being intermixed with foreign nations, or subjugated by any other power, their language muſt be very ancient. The two principal dialects of it were that ſpoken by the Hamyarites and other genuine Arabs; and that of the Koreiſh, in which Mahomet wrote the Alcoran. The former is named by oriental writers *the Arabic of Hamyar;* the latter, *the pure*, or *defecated Arabic*. Mr Richardſon obſerves, as a proof of the richneſs of this language, that it conſiſts of 2000 radical words.

11 for by the Arabians.

The old Arabic characters are ſaid to have been of very high antiquity; for Ebn Haſhem relates, that an inſcription in it was found in Yaman as old as the days of Joſeph. Hence ſome have ſuppoſed that the Arabians were the inventors of letters; and Sir Iſaac Newton is of opinion, that Moſes learned the alphabet from the Midianites, who were Arabians.

The alphabet of the Arabs conſiſts of 28 letters ſimilar to the ancient Cufic, in which the firſt copies of the Alcoran were written. The preſent Arabic characters were formed by Ebn Moklah, a learned Arabian, who lived about 300 years after Mahomet. The Arabian writers themſelves inform us, that their alphabet is not very ancient, and that they received it only a ſhort time before the introduction of Iſlamiſm.

On this account of the pretenſions of different nations to the invention of letters, Mr Aſtle makes the following reflections. "The vanity of each nation induces them to pretend to the moſt early civilization; but ſuch is the uncertainty of ancient hiſtory, that it is difficult to determine to whom the honour is due. It ſhould ſeem, however, that the conteſt may be confined to the Egyptians, the Phœnicians, and the Chaldeans. The Greek writers, and moſt of thoſe who have copied them, decide in favour of Egypt, becauſe their information is derived from the Egyptians themſelves. The poſitive claim of the Phœnicians does not depend entirely upon the teſtimony of Sanchoniatho; the credit of his hiſtory is ſo well ſupported by Philo of Byblus his tranſlator, Porphyry, Pliny, Curtius, Lucan, and other ancient writers, who might have ſeen his works entire, and whoſe relations deſerve at leaſt as much credit as thoſe of the Egyptian and Greek writers. It muſt be allowed, that Sanchoniatho's hiſtory contains many fabulous accounts; but does not the ancient hiſtory of the Egyptians, the Greeks, and moſt other nations, abound with them to a much greater degree? The fragments which we have of this moſt ancient hiſtorian are chiefly furniſhed by Euſebius, who took all poſſible advantages to repreſent the Pagan writers in the worſt light, and to render their theology abſurd and ridiculous.

12 Letters moſt probably invented in Phœnicia.

"The Phœnician and Egyptian languages are very ſimilar; but the latter is ſaid to be more large and full, which is an indication of its being of a later date. The opinion of Mr Wiſe, however, that the ancient Egyptians had not the knowledge of letters, ſeems to be erroneous; as they had commercial intercourſe with their neighbours the Phœnicians, they probably had the knowledge of letters, if their policy, like that of the Chineſe at this day, did not prohibit the uſe of them.

"The Chaldeans, who cultivated aſtronomy in the moſt remote ages, uſed ſymbols or arbitrary marks in their calculations; and we have ſhown, that theſe were the parents of letters. This circumſtance greatly favours their claim to the invention; becauſe Chaldea, and the countries adjacent, are allowed by all authors, both ſacred and profane, to have been peopled before Egypt; and it is certain that many nations ſaid to be deſcended from Shem and Japhet, had their letters from the Phœnicians, who were deſcended from Ham. Alphabet.

"It is obſervable, that the Chaldeans, the Syrians, Phœnicians, and Egyptians, all bordered upon each other; and as the Phœnicians were the greateſt as well the moſt ancient commercial nation, it is very probable that they communicated letters to the Egyptians, the ports of Tyre and Sidon being not far diſtant from each other.

"Mr Jackſon is evidently miſtaken when he ſays, that letters were invented 2619 years before the birth of Chriſt. The deluge recorded by Moſes was 2349 years before that event; and if letters were not invented till 550 years after, as he aſſerts, we muſt date their diſcovery only 1799 years before the Chriſtian æra, which is 410 years after the reign of Menes the firſt king of Egypt, who, according to Syncellus and others, is ſaid to have been the ſame perſon with the Miſor of Sanchoniatho, the Mizraim of the Scriptures, and the Oſiris of the Egyptians; but whether this be true or not, Egypt is frequently called in Scripture *the land of Mizraim*.

"This Mizraim, the ſecond ſon of Amyn or Ham, ſeated himſelf near the entrance of Egypt at Zoan, in the year before Chriſt 2188, and 160 years after the flood. He afterwards built Thebes, and ſome ſay Memphis. Before the time that he went into Egypt, his ſon Taaut had invented letters in Phœnicia; and if this invention took place ten years before the migration of his father into Egypt, as Mr Jackſon ſuppoſes, we may trace letters as far back as the year 2178 before Chriſt, or 150 years after the deluge recorded by Moſes: and beyond this period, the written annals of mankind, which have been hitherto tranſmitted to us, will not enable us to trace the knowledge of them; though this want of materials is no proof that letters were not known until a century and an half after the deluge. As for the pretenſions of the Indian nations, we muſt be better acquainted with their records before we can admit of their claim to the firſt uſe of letters; eſpecially as none of their manuſcripts of any great antiquity have as yet appeared in Europe. That the Arabians were not the inventors of letters, has appeared by their own confeſſion.—Plato ſomewhere mentions Hyperborean letters very different from the Greek; theſe might have been the characters uſed by the Tartars or ancient Scythians. 13

"It may be expected that ſomething ſhould be ſaid concerning thoſe books mentioned by ſome authors to have been written before the deluge. Amongſt others, Dr Parſons, in his Remains of Japhet, p. 346. 359. ſuppoſes letters to have been known to Adam; and the Sabeans produce a book which they pretend was written by Adam. But concerning theſe we have no guide to direct us any more than concerning the ſuppoſed books of Enoch; ſome of which, Origin tells us, were found in Arabia Felix, in the dominion of the queen of Saba. Tertullian affirms, that he ſaw and

Of antediluvian writing.

Alphabet.

and read several pages of them; and in his treatise *De Habitu Mulierum*, he places those books among the canonical: but St Jerom and St Austin look upon them to be apocryphal. William Postellus pretended to compile his book *De Originibus* from the book of Enoch; and Thomas Bangius published at Copenhagen, in 1657, a work which contains many singular relations concerning the manner of writing among the antediluvians, which contains several pleasant stories concerning the books of Enoch.

"With regard to this patriarch, indeed, St Jude informs us, that he *prophesied*, but he does not say that he *wrote*. The writings, therefore, attributed to the antediluvians, must appear quite uncertain; though it might be improper to assert that letters were unknown before the deluge recorded by Moses."

14 All the alphabets in the world cannot be proved to arise from one original.

Our author proceeds to show, that all the alphabets in the world cannot be derived from one original; because there are a variety of alphabets used in different parts of Asia, which vary in name, number, figure, order, and power, from the Phœnician, ancient Hebrew, or Samaritan. In several of these alphabets also, there are marks for sounds peculiar to the language of the east, which are not necessary to be employed in the notation of the languages of Europe.

None of the alphabets to the east of Persia have any connection with the Phœnician or its derivatives, except where the Arabic letters have been introduced by the conquests of the Mahometans. The foundation of all the Indian characters are those called *shanscrit*, or *sungskrit*. This signifies something brought to perfection, in contradistinction to *prakrit*, which signifies vulgar or unpolished. Hence the refined and religious language and characters of India are called *Sungskrit*, and the more vulgar mode of writing and expression *Prakrit*. From this Shanscrit are derived the sacred characters of Thibet, the Cashmirian, Bengalese, Malabaric, and Tamoul; the Singalese, Siamese, Maharattan, Concanee, &c. From the same source we may derive the Tangutic or Tartar characters, which are similar, in their great outlines, to the Shanscrit; though it is not easily determined which is derived from the other. The common Tartar is generally read, like the Chinese, from top to bottom.

There are, however, several alphabets used in different parts of Asia, entirely different not only from the Shanscrit and all those derived from it, but also from the Phœnician and those which proceed from it. Some of these are the alphabet of Pegu, the *Batta* characters used in the island of Sumatra, and the *Barman* or *Boman* characters used in some parts of Pegu. The names and powers of the letters of which these alphabets are composed, differ entirely from the Phœnician, or those derived from them. It is impossible to assimilate their forms, and indeed it is by no means easy to conceive how the 50 letters of the Shanscrit language could be derived from the Phœnician alphabet, which consisted originally only of 13; though it is certain, that by far the greater number of alphabets now in use are derived from the ancient Hebrew, Phœnician, or Samaritan.

Mr Astle next proceeds to consider what alphabets are derived from the Phœnician. These he supposes to have been immediately the ancient Hebrew or Samaritan; the Chaldaic; the Bastulian (A) or Spanish Phœnician; the Punic, Carthaginian, or Sicilian; and the Pelasgian. From the ancient Hebrew proceeded the Chaldaic or square Hebrew; the round Hebrew; and what is called the *running hand of the Rabbins*. The Pelasgian gave birth to the Etruscan, Eugubian, or Umbrian, Oscan, Samnite, and Ionic Greek, written from the left. From the Chaldaic or square Hebrew are derived the Syriac, and the ancient and modern Arabic. The Syriac is divided into the Estrangelo and Mendæan, and the modern Arabic has given rise to the Persian and Turkish. From the ancient Arabic are derived the Kufic or Oriental, the Mauritanic or Occidental; the African or Saracen, and the Moorish. The Ionic Greek gave rise to the Arcadian, Latin, ancient Gaulish, ancient Spanish, ancient Gothic, Coptic, Ethiopic, Russian, Illynian or Sclavonic, Bulgarian and Armenian. From the Roman are derived the Lombardic, Visigothic, Saxon, Gallican, Franco-Gallic or Merovingian, German, Caroline, Capetian, and modern Gothic.

Alphabet. 15 Alphabets derived from the Phœnician.

The Punic letters are also called *Tyrian*, and were much the same with the Carthaginian or Sicilian. The Punic language was at first the same with the Phœnician; it is nearly allied to the Hebrew, and has an affinity with the Chaldee and Syriac. Some remains of it are to be met with in the Maltese. To make a complete Punic, Carthaginian, or Sicilian alphabet, we must admit several pure Phœnician letters.

The Pelasgi were likewise of Phœnician original; and, according to Sanconiatho, the Dioscuri and Cabiri wrote the first annals of the Phœnician history, by order of Taaut the inventor of letters. They made ships of burthen, and being cast upon the coast near mount Casius, about 40 miles from Pelusium, where they built a temple in the second generation after the deluge related by Moses, they were called *Pelasgi* from their passing by sea, and wandering from one country to another. Herodotus informs us, that the Pelasgi were descendants of the Phœnician Cabiri, and that the Samothracians received and practised the Cabiric mysteries from them. The Pelasgic alphabet prevailed in Greece till the time of Deucalion, when the Pelasgi were driven out of Thessaly or Oenotria by the Hellenes; after which some of them settled at the mouth of the Po, and others at Croton, now *Cartona* in Tuscany. Their alphabet consisted of 16 letters, and the Tyrrhenian alphabet, brought into Italy before the reign of that prince, consisted of no more than 13. Deucalion is said to have reigned about 820 years after the deluge, and 1529 before the Christian æra.

That the Tyrrheni, Tyrseni, or Hetrusci, settled in Italy long before this period, appears from the testimony of Herodotus, who informs us, that a colony went by sea from Lydia into Italy under Tyrrhenus; and Dionysius of Halicarnassus proves that many authors called them Pelasgi. He then cites Hellanicus Lesbicus, an author somewhat more ancient than Herodotus,

(A) The Bastuli are said to have been a Canaanitish or Phœnician people who fled from Joshua, and settled afterwards in Spain.

Alphabet.

rodotus, to prove, that they were first called *Pelasgi Tyrrheni;* and when they passed into Italy, they settled in that part of it called *Etruria*. Their emigration took place about the year of the world 2011, or 1993 years before the Christian æra, which is 350 years before the Pelasgi left Greece. Bishop Cumberland adduces many proofs to show that the Tyrrhenians originally came out of Lydia into Italy. Several Roman authors also speak of this Lydian colony; and Horace compliments his patron Mæcenas upon his Lydian descent:

Lydorum quicquid Etruscos
Incoluit fines, nemo generosior est te.

The Etruscan letters are Pelasgic, and several of the Etruscan inscriptions are written in the Pelasgic language. The Roman letters are Ionic. The Oscan language was a dialect of the Etruscan; their characters are nearer the Ionic or Roman than the Etruscan. There is also very little difference between the Pelasgian, Etruscan, and most ancient Greek letters, which are placed from right to left. The Arcadians were ancient Greeks, and used the Ionic letters; but at what time they began to write from left to right is not known, as their chronology is very uncertain. The Etruscan, Oscan, and Samnite alphabets, are derived from the Pelasgic; they differ from each other more in name than in form, but a far greater number are derived from the Ionic Greek; namely, the Arcadian, the Latin or Roman, and the others already enumerated. The Runic is immediately derived from the Gothic.

According to Dionysius of Halicarnassus, the first Greek colony which came into Italy consisted of Arcadians under the conduct of Oenotrus the son of Lycaon, and fifth in descent from Phoroneus the first king of Argos, who reigned about 566 years before the taking of Troy, and 1750 years before the Christian æra. These Oenotrians were called *Aborigines;* and after they had been engaged for many years in a war with the Siculi, entered into an alliance with a colony of the Pelasgi, who came out of Thessaly into Italy, after having been driven from the former country.—About 1476 B. C. another colony of the Pelasgi, who had been driven out of Thessaly by the Curetes and Leleges, arrived in Italy, where they assisted the Aborigines to drive out the Siculi; possessing themselves of the greatest part of the country between the Tiber and the Liris, and building several cities. Solinus and Pliny tell us, that the Pelasgi first carried letters into Italy; and the latter distinguishes between the Pelasgi and the Arcades: so the letters first carried into Italy were not the Ionic Greek, but those more ancient Pelasgi characters which the Pelasgi carried with them before Deucalion and Cadmus are said to have come into Bœotia and Thessaly. The story of Cadmus is much involved in fable; but it is agreed by most of the ancients, that the children of Agenor, viz. Cadmus, Europa, Phœnix, and Cilix, carried with them a colony, composed of Phœnicians and Syrians, into Asia Minor, Crete, Greece, and Lybia, where they introduced letters, music, poetry, and other arts, sciences, and customs, of the Phœnicians.

Dionysius enumerates the following Greek colonies which came into Italy: 1. The Aborigines under Oenotrus from Arcadia. 2. The Pelasgic colony which came from Hœmonia or Thessaly. 3. Another Arcadian colony which came with Evander from Palantium. 4. Those who came from Peloponnesus with Hercules; and, 5. Those who came with Æneas from Troy. It is not easy to discover when the Ionic way of writing from left to right was introduced into Italy; but it is certain, that it did not universally prevail even in Greece till several ages after it was found out. The Athenians did not comply with it till the year of Rome 350; nor was it practised by the Samnites even in the sixth century of that city, or 230 years before Christ: for M. Gæbelin, Vol. VI. pl. 2. gives us the Samnite alphabet of that century, wherein the letters are placed from right to left; although the Ionic way of writing prevailed in some parts of Italy in the third century of Rome. "In time (says Pliny), the tacit consent of all nations agreed to use the Ionic letters. The Romans consented to this mode about the time of Tarquinius Priscus their fifth king." The letters brought by Damaratus the Corinthian, the father of Tarquin, Mr Wise thinks, must have been the new or Ionic alphabet, and not the same with that brought by Evander 500 years before. After the Romans had established the use of the Ionic letters, they seem not to have acknowledged the Pelasgian and Etruscan to have been Greek alphabets: the most learned of them knew none older than the Ionic, as appears from the Greek Farnese inscriptions of Herodes Atticus. This learned man, out of a regard to antiquity, caused the oldest orthography to be observed in the writing, and the letters to be delineated after the most antique forms that could be found; and they are plainly no other than the Ionic or right-handed characters.

The ancient Gaulish letters are derived from the Greek, and their writing approaches more nearly to the Gothic than that of the Romans: this appears by the monumental inscription of Gordian, messenger of the Gauls, who suffered martyrdom in the third century with all his family. These ancient Gaulish characters were generally used by that people before the conquest of Gaul by Cæsar; but after that time the Roman letters were gradually introduced. The ancient Spaniards used letters nearly Greek before their intercourse with the Romans. The ancient Gothic alphabet was very similar to the Greek, and is attributed to Ulphilas, bishop of the Goths, who lived in Mæsia about 370 years after Christ. He translated the bible into the Gothic tongue. This circumstance might have occasioned the tradition of his having invented these letters; but it is probable that these characters were in use long before this time. The Runic alphabet is derived from the ancient Gothic.

See Plates IX and X. for specimens of the ancient alphabets here enumerated.

The Coptic letters are derived immediately from the Greek. Some have confounded them with the ancient Egyptian; but there is a very material difference between them. The Ethiopic alphabet is derived from the Coptic.

The alphabet proceeding from that of the Scythians established in Europe, is the same with what St Cyril calls the *Servien*. The Russian, Illyrian or Sclavonic, and the Bulgarian, are all derived from the Greek. The Armenian letters differ very much from the Greek, from which they are derived, as well as from the Latin.

16

Alphabets derived from the Latin.

With regard to the alphabets derived from the Latin, the Lombardic relates to the manuscripts of Italy;

Alphabet. the Visigothic to those of Spain; the Saxon to those of England; the Gallican and Franco-Gallic or Merovingian to the manuscripts of France; the German to those of that country; and the Caroline, Copetian, and Modern Gothic, to all the countries of Europe who read Latin. The first six of these alphabets are before the age of Charlemagne, the last three posterior to it. They are more distinguished by their names than the forms of their characters, and the former indicate all of them to have been of Roman extraction. Each nation, in adopting the letters of the Romans, added thereto a taste and manner peculiar to itself, which obviously distinguished it from the writings of all other people; whence arose the differences between the writings of the Lombards, Spaniards, French, Saxons, Germans, and Goths, and all the strange terms observable in the writings of the Francic Gauls or Merovingians; and those of the Carlovingians their successors may be traced from the same source. From these distinctions the name of *national writing* was derived.

The writing of Italy was uniform till the irruption of the Goths, who disfigured it by their barbarous taste. In 569, the Lombards, having possessed themselves of all Italy, excepting Rome and Ravenna, introduced that form of writing which goes under their name; and as the Popes used the Lombardic manner in their bulls, the name of *Roman* was sometimes given to it in the 11th century; and though the dominion of the Lombards continued no longer than 206 years, the name of their writing continued in Italy from the 7th to the 13th century, and then ceased; when learning, having declined in that as well as in other countries, the manner of writing degenerated into the modern Gothic.

The Visigoths introduced their form of writing into Spain, after having over-run that country; but it was abolished in a provincial synod held at Leon in 1091, when the Latin characters were established for all public instruments, though the Visigothic were used in private writings for three centuries afterwards.

The Gauls, on being subjected by the Romans, adopted their manner of writing; but by subsequent additions of their own, their characters were changed into what is called the Gallican or *Roman Gallic* mode. This was changed by the Franks into the *Franco-Gallic* or *Merovingian* mode of writing, being practised under the kings of the Merovingian race. It took place towards the close of the sixth century, and continued till the beginning of the ninth.

The German mode of writing was improved by Charlemagne, and this improvement occasioned another distinction in writing by introducing the alphabet named *Caroline*, which declined in the 12th century, and was succeeded in the 13th by the modern Gothic. In France it had degenerated by the middle of the 10th century, but was restored in 987 by Hugh Capet, whence it obtained the name of *Capetian*. It was used in England as well as Germany and France.

The modern Gothic, which spread itself all over Europe in the 12th and 13th centuries, is improperly named, as not deriving its origin from the writing anciently used by the Goths. It is, however, the worst and most barbarous way of writing, and originated among the schoolmen in the decline of the arts; being indeed nothing else than Latin writing degenerated. It began in the 12th century, and was in general use, especially among monks and schoolmen, in all parts of Europe, till the restoration of arts in the 15th century, and continued longer in Germany and the northern nations. Our statute-books are still printed in Gothic letters. The most barbarous writing of the seventh, eighth, and ninth centuries, was preferable to the modern Gothic. It is diversified in such a manner as can scarce admit of description; and the abbreviations used by the writers were so numerous, that it became very difficult to read it; which was one of the great causes of the ignorance of those times. Along with this, however, the Lombardic, Gothic, Roman, Caroline, and Copetian modes of writing, were occasionally used by individuals.

The idea that all the alphabets above mentioned are derived from the Roman, tends to prove the distinction of national writing, and is of great use in discovering the age of manuscripts: for though we may not be able exactly to determine the time when a manuscript was written, we may be able nearly to ascertain its age. For example, if a writing is Morvingian, it may be declared not to be posterior to the ninth, nor prior to the fifth, century. If another be Lombardic, it may be affirmed to be posterior to the middle of the 6th, and prior to the 13th. Should it be Saxon, it cannot be of an earlier date than the 7th, nor later than about the middle of the 12th.

17 Letters could not take place but from a decomposition of language.

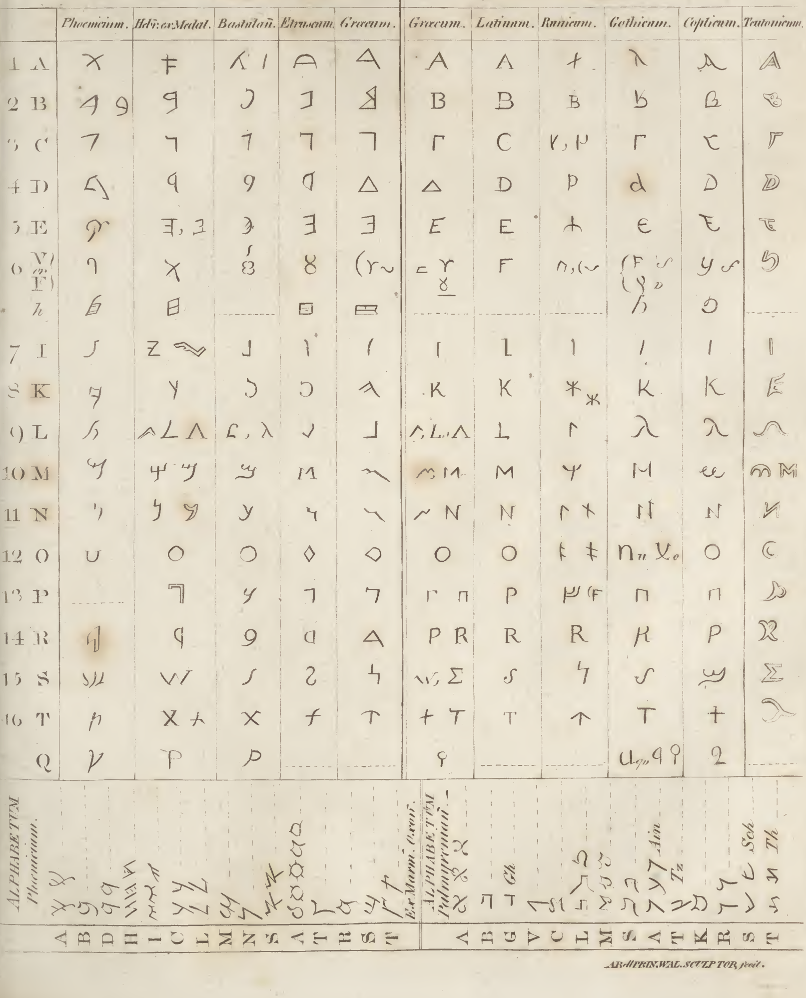
Having considered whence the alphabets now in use throughout the various nations of the world are derived, it remains to say something concerning them as the elements of words, or how far they are capable of expressing those sounds, which, by proper combination and arrangement, constitute articulate language. The number of simple sounds in any language cannot be very numerous; and it is plainly these simple sounds alone that we have occasion to represent by alphabetical characters. Hence the person who first invented letters, must have been capable of analysing language in a manner which seems by no means easy to do, and concerning which even the learned among ourselves are not yet agreed. It is this difficulty which has produced the great diversity in the number of alphabetical characters used by different nations; and where we see a vast number of them used, we may account the writing not the better, but much the worse for it; and whoever the pretended inventor was, it is more reasonable to suppose that he disfigured an alphabet already invented, by unnecessary additions, than been the author of one himself.

18 Probably not the result of a progressive evolution of the human powers.

When we consider alphabetical characters as thus resulting from an analysis of language, it will by no means appear probable that it was derived from a gradual and progressive operation of the human mind through many ages. There is not the least affinity betwixt representing any object by a picture and finding out the sounds which compose the word by which it is expressed; nor, though a nation had been in use to represent things either in this method, or by any kind of arbitrary marks, for thousands of years, could the one ever have led to the other. Arbitrary marks must always be the same with pictures in this respect, that they must always be fixed to particular objects, and thus be increased *ad infinitum*. Letters, on the other hand, are indifferent to all

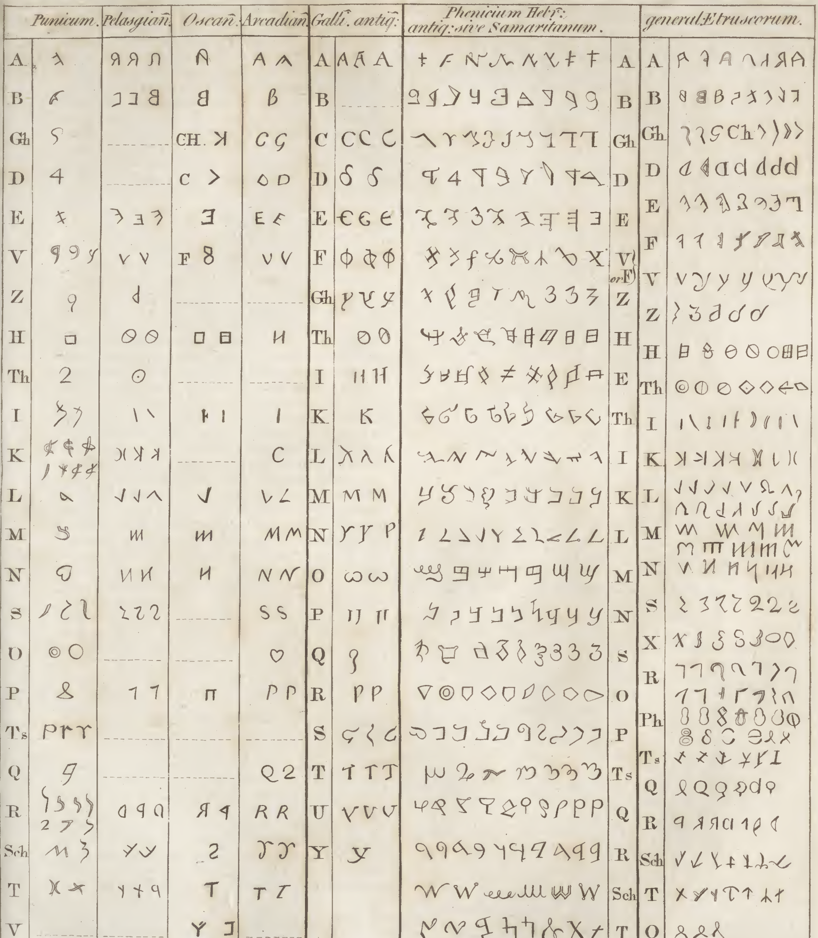
ALPHABETA ANTIQUISSIMA.

a dextra ad sinistram exarat. — a sinistra ad dextram.



A. BELL PRIN. WAL. SCULPTOR, fecit.

ALPHABETA ANTIQUA. Plate X.



A. Bell PRIN. WAL. SCULPTOR, fecit.

Alphabet. all objects; and therefore, by their combinations, which are more numerous than as many arbitrary marks as we could remember, may expreſs all the objects in nature. This might furniſh an argument of ſome ſtrength for the divine revelation of writing, were it not that other arts ſeemingly as uſeful, and as difficult to be invented, had not been expreſsly aſcribed to particular perſons whom we cannot ſuppoſe to have been divinely inſpired. Thus metallurgy, muſic, the keeping of cattle, and uſe of tents, are all aſcribed to a ſingle family; and though writing be not expreſsly mentioned as an invention in Scripture, there is no reaſon to have recourſe to a revelation for it as long as the human faculties are known to have been ſufficient for the invention of it. Nevertheleſs, if we take a review of the different arts which mankind have invented, we ſhall find, that few of them reſulted from any gradual progreſs or evolution of the powers of the human mind, but rather by ſome ſudden and almoſt unaccountable turn of thought in an individual. Thus, the art of printing, little inferior in its utility to that of writing, lay hid for ages, and was at laſt invented we ſcarce know how; ſo that if one inclined to ſuppoſe this a divine revelation, he could be at little loſs for arguments to ſupport his hypotheſis. This was what all the inventions and evolutions of human powers ſince the creation had never been able to accompliſh; yet nobody believes that it required ſupernatural abilities to be the author of this art, becauſe we ſee plainly that it might have occurred to the human mind from various ſources, and are ſurpriſed that it did not occur long before. In like manner, the method of accounting for the celeſtial motions by the united forces of projection and gravitation, was no reſult of the progreſs that mankind had made in ſcience, but luckily occurred to Mr Horrox, without any thing that we know to direct him, or perhaps from cauſes almoſt unknown to himſelf. Thus alſo, the ſteam-engine, aeroſtation, &c. were ſuddenly invented only by a ſlight review of principles well known before, and which had been a thouſand times overlooked by thoſe who might have invented both. Alphabetic writing, therefore, might have been no deduction from hieroglyphic or picture writing, from which it is eſſentially different; and it ſeems to be ſome confirmation of this, that all nations who ever pretended to the invention of letters, have aſcribed it to the labours of one particular perſon, without taking notice of the progreſs made towards it in preceding ages.

19 Of the elementary ſounds of language.

The learned author of Hermes informs us, that to about 20 plain elementary ſounds, we owe that variety of articulate voices which have been ſufficient to explain the ſentiments of ſuch an innumerable multitude as all the paſt and preſent generations of men. Mr Sheridan ſays, that the number of ſimple ſounds in our tongue are 28; while Dr Kenrick ſays, that we have only 11 diſtinct ſpecies of articulate ſounds, which even by contraction, prolongation, and compoſition, are increaſed only to the number of 16; every ſyllable or articulate ſound in our language being one of the number. Biſhop Wilkins and Dr William Holder ſpeaks of 33 diſtinct ſounds.

After the analyſis or decompoſition of language into the elementary ſounds, the next towards the notation of it by alphabetical characters, would be the delineation of a ſeparate mark or letter to repreſent each ſound; which marks, though few in number, would admit of ſuch a variety of arrangements and combinations, as might be capable of producing that infinity of articulate ſounds which compoſe language. The ingenious Wachter, in his *Natura et Scriptura Concordia*, p. 64, endeavours to ſhow, that ten marks or characters are ſufficient for this purpoſe.—His ſcheme is as follows:

Genus.	*Figura.*	*Poteſtas.*
Vocal.	○	a. e. i. o. u.
Guttural.	⫯	k. c. ch. q. g. h.
Lingual.	∠	l.
Lingual.	T	d. t.
Lingual.	—⊃	r.
Dental.	⊓	ſ.
Labial.	3	b. p.
Labial.	m	m.
Labial.	⊢	s. ph. v. w.
Naſal.	ʌ	n.

If this is the caſe, then the moſt ſimple alphabet, which conſiſted only of 13 letters, muſt have been abundantly ſufficient to anſwer all the purpoſes of mankind, and much of our twenty-four letter alphabet may appear ſuperfluous. That able mathematician Tacquet has calculated the various combinations of the 24 letters, even without any repetition, to amount to no fewer than 620,448,401,733,239,439,360,000; while Clavius makes them only 5,852,616,738,497,664,000. Either of theſe numbers, however, is *infinite* to the human conceptions, and much more than ſufficient to expreſs all the ſounds that ever were articulated by man. As there are more ſounds in ſome languages than in others, it follows of courſe, that the number of elementary characters, or letters, muſt vary in the alphabets of different languages. The Hebrew, Samaritan, and Syriac alphabets, have 22 letters; the Arabic 28, the Perſian and Egyptian, or Coptic, 32; the preſent Ruſſian 41; the Shanſcrit 50; while the Caſhmirian and Malabaric are ſtill more numerons. The following is the ſcheme of the Engliſh alphabet as given by Mr Sheridan in his Rhetorical Grammar, p. 9.

20 Number of letters in different alphabets.

Number of ſimple ſounds in our tongue 28.

	3	1	2	3	2	3	1	1	1
9 *Vowels*,	a	a	a	e	o	o	e	i	u
	hall	hat	hate	beer	note	nooſe	bet	fit	but

w ſhort oo — y ſhort ee

19 *Conſonants*, { eb ed ef eg ek el em en ep er es et ev ez eth eth eſh ezh ing.

2 *Superfluous*, c, which has the power of *ek* or *eſs*; q, that of *ek* before *u*.

2 *Compound*, *j*, which ftands for *edzh;*
x, for *ks* or *gz*.
1 *No letter*, *h*, merely a mark of afpiration.

Confonants divided into Mutes and Semivowels.

6 *Mutes*, eb ed eg ek ep et.
3 *Pure Mutes*, ek ep et.
3 *Impure*, eb ed eg.

13 *Semivowels, or liquids*, ef el em en er efs ev ez etħ eth efh ezh ing.
9 *Vocal*, el em en er ev ez eth ezh ing.
4 *Afpirated*, ef efs etħ efh.

Divided again into

4 *Labial*, eb ep ev ef.
8 *Dental*, ed et eth etħ ez efs ezh efh.
4 *Palatine*, eg ek el er.
3 *Nafal*, em en ing.

21 Imperfection in the Englifh alphabet. Mr Sheridan obferves, that our alphabet is ill calculated for the notation of the Englifh tongue, as there are many founds for which we have no letters or marks: and there ought to be nine more characters or letters to make a complete alphabet, in which every fimple found ought to have a mark peculiar to itfelf. The reafon of the deficiency is, that the Roman alphabet was formerly adopted for the notation of the Englifh language, though by no means fuited to the purpofe.

22 Of the forms of letters. It now remains only to take fome notice of the forms of the different letters; fome knowledge of which is abfolutely neceffary for afcertaining the age and authenticity of infcriptions, manufcripts, charters, and ancient records. Many authors are of opinion that letters derive their forms from the pofitions of the organs of fpeech in their pronunciation. Van Helmont has taken great pains to prove, that the Chaldaic characters are the genuine alphabet of Nature; becaufe, according to him, no letter can be rightly founded without difpofing the organs of fpeech into an uniform pofition with the figure of each letter; and in fupport of this fyftem, he has anatomifed the organs of articulation.

Mr Nelme has endeavoured to fhow, that all elementary characters or letters derive their forms from the line and the circle. His alphabet confifts of 13 radical letters, four diminifhed, and four augmented.—The radicals are L, O, S, A, B, C, D, N, U, I, E, M, R.—H, according to him, is derived from A; P from B; T from D; and F from U: thefe are called diminifhed letters. The augmented ones are Z from S; G from C; W from U; and Y from I. He proves that his characters are very fimilar to thofe of the ancient Etrufcans: but all characters are compofed either of lines and circles of the former, and of parts of the latter.—Mr Gebelin deduces them from hieroglyphic reprefentations, and has given feveral delineations of human figures, trees, &c. in confirmation of his hypothefis.

One of the moft fimple alphabets has been formed, by making two perpendicular and two horizontal lines:

thus, a|b|c / d|e|f / g|h|i from which may be deduced nine different characters or letters; thus a b c d e f g h i.

Nine more may be made by adding a point to each, k | l | m and as many more as n | o | p may be fufficient q | r | s for the notation of any language, by adding two or more points to each character. Though thefe fquare characters are not calculated for difpatch; yet they may be made as expeditioufly, or more fo, than the Tartar, the Bramin, the Cafhmirian, or many others. Writing compofed of thefe characters, is at firft fight fomewhat

23 New language invented by Mr Dow. like the Hebrew.—Mr Dow, author of the Hiftory of Indoftan, lately formed a new language and alphabet. This language, and the characters formed for its notation, were fo eafy, that a female of his acquaintance acquired the knowledge of them in three weeks, and correfponded with him therein during their intimacy.

ALPHÆNIX, white barley-fugar, to which is given an extraordinary name, to render it more valuable. This fugar, which is thought good for colds, is made of common fugar, which is boiled until it becomes eafy to crack, when they pour it upon a marble table, greafed with oil of fweet almonds, and mould it into various figures with a brafs crotchet. It is eafily falfified with ftarch.

ALPHERY (Mikipher), born in Ruffia, and of the Imperial line. When that country was torn to pieces by inteftine quarrels, in the latter end of the 16th century, and the royal houfe particularly was fo feverely perfecuted by impoftors, this gentleman and his two brothers were fent over to England, and recommended to the care of Mr Jofeph Bidell, a Ruffia merchant. Mr Bidell, when they were of age fit for the univerfity, fent them all three to Oxford, where the fmall-pox unhappily prevailing, two of them died of it. We know not whether this furviving brother took any degrees or not, but it is very probable he did, fince he entered into holy orders; and in the year 1618, had the rectory of Wooley in Huntingtonfhire, a living of no very confiderable value, being rated at under L. 10 in the king's books. Here he did his duty with great cheerfulnefs and alacrity; and although he was twice invited back to his native country by fome who would have ventured their utmoft to have fet him on the throne of his anceftors, he chofe rather to remain with his flock, and to ferve God in the humble ftation of a parifh prieft. Yet in 1643, he underwent the fevereft trials from the rage of the fanatics; who, not fatisfied with depriving him of his living, infulted him in the moft barbarous manner; for having procured a file of mufqueteers to pull him out of his pulpit, as he was preaching on a Sunday, they turned his wife and fmall children into the ftreet, into which alfo they threw his goods. The poor man in this diftrefs raifed him a tent under fome trees in the church-yard, over againft his houfe, where he and his family lived for a week. One day having gotten a few eggs, he picked up fome rotten wood and dry fticks, and with thefe made a fire in the church-porch in order to boil them; but fome of his adverfaries, to fhow how far they could carry their rage againft the church, for this poor man was fo harmlefs they could have none againft him, came and kicked about his fire, threw down his fkillet, and broke his eggs. After this, having ftill a little money, he made a fmall purchafe in that neighbourhood, built him

him a houfe, and lived there fome years. He was encouraged to this by a prefbyterian minifter who came in his room, who honeftly paid him the fifth part of the annual income of the living, which was the allowance made by parliament to ejected minifters, treated him with great humanity, and did him all the fervices in his power. It is a great misfortune that this gentleman's name is not preferved, his conduct in this refpect being the more laudable, becaufe it was not a little fingular. Afterwards, probably on the death or removal of this gentleman, Mr Alphery left Huntingtonfhire, and came and refided at Hammerfmith till the Reftoration put him in poffeffion of his living again. He returned on this occafion to Huntingtonfhire, where he did not ftay long; for being upwards of 80, and withal very infirm, he could not perform the duties of his function. Having, therefore, fettled a curate, he retired to his eldeft fon's houfe at Hammerfmith, where fhortly after he died, full of years and of honour.

ALPHEUS, (Strabo); ALPHEIUS, (Ptolemy); a noted and large river of the Peleponnefus; which, rifing in, and after feveral windings running through, Arcadia, and by Olympia in Elis, with a fouth-weft courfe, pours into the Sinus Chelonites, about ten miles to the fouth of Olympia. It has a common fpring with the Eurotas, at the foot of mount Parthenius, near the village Afea, (Strabo.) The Alpheus and Eurotas mix and run together for 20 ftadia; after which, they enter a fubterraneous paffage at Mantinea; then again emerge, the Eurotas in Laconica, and the Alpheus in the territory of Megalopolis, (Paufanias.) The poets fable ftrange things of this river; particularly, that, out of love to the nymph *Arethufa*, it runs under the fea to Sicily, and burfts out at the fountain of that name in Syracufe, (Virgil). Its waters were reckoned good in the leprofy, which is called Αλφος by the Greeks; and hence the name *Alpheus*.—Paufanias adds, that the Eleans had a law, which condemned any woman to death that fhould either appear at the Olympic games, or even crofs this river during that folemnity: and the Eleans add, that the only woman who tranfgreffed it, had difguifed herfelf in the habit of a mafter or keeper of thefe games, and conducted her fon thither; but when fhe faw him come off victorious, her joy made her forget her difguife, fo that her fex was difcovered. She was pardoned, but from that time a law was made that the keepers fhould appear there naked.

ALPHONSIN, in furgery, an inftrument for extracting bullets out of gun-fhot wounds. This inftrument derives its name from the inventor Alphonfus Ferrier, a phyfician of Naples. It confifts of three branches, which are clofed by a ring. When clofed and introduced into the wound, the operator draws back the ring towards the handle, upon which the branches opening take hold of the ball; and then the ring is pufhed from the haft, by which means the branches grafp the ball fo firmly, as to extract it from the wound.

ALPHONSUS X. king of Leon and Caftile, furnamed the Wife, was author of the aftronomical tables called *Alphonfine*. Reading of Quintus Curtius gave him fuch delight, that it recovered him out of a dangerous illnefs. He read the Bible fourteen times, with feveral comments on it. He is faid to have found fault with the ftructure of the mundane fyftem, and has been charged with impiety on that fcore; but unjuftly, for he only found fault with the involved fyftem of fome aftronomers. He was dethroned by his fon Sancho; and died of grief, A. D. 1284.

ALPINI (Profpero), a famous phyfician and botanift, born in the Venetian territory, in 1553. He travelled in Egypt to acquire a knowledge of exotic plants, and was the firft who explained the fructification and generation of plants by the fexual fyftem. Upon his return to Venice, in 1586, Andrea Doria, prince of Melfi, appointed him his phyfician: and he diftinguifhed himfelf fo much in this capacity, that he was efteemed the firft phyfician of his age. The republic of Venice began to be uneafy, that a fubject of theirs, of fo great merit as Alpini, fhould continue at Genoa, when he might be of fo much fervice and honour to their ftate: they therefore recalled him in 1593, to fill the profefforfhip of botany at Padua; and he had a falary of 200 florins, which was afterwards raifed to 750. He difcharged this office with great reputation; but his health became very precarious, having been much broke by the voyages he had made. According to the regifter of the univerfity of Padua, he died the 5th of February 1617, in the 64th year of his age; and was buried the day after, without any funeral pomp, in the church of St Anthony.—Alpini wrote the following works in Latin: 1. Of the phyfic of the Egyptians, in four books. Printed at Venice, 1591, in 4to. 2. A treatife concerning the plants of Egypt. Printed at Venice, 1592, in 4to. 3. A dialogue concerning balfams. Printed at Venice, 1592, in 4to. 4. Seven books concerning the method of forming a judgment of the life or death of patients. Printed at Venice, 1691, in 4to. 5. Thirteen Books concerning methodical Phyfic. Padua, 1611, folio; Leyden, 1719, in 4to. 6. A Difputation held in the fchool at Padua, concerning the Raphonticum. Padua, 1612, and 1629, 4to. 7. Of exotic plants, in two books. Venice, 1699, in 4to. He left feveral other works, which have never been printed; particularly, 8. The fifth book concerning the phyfic of the Egyptians. 9. Five books concerning the natural hiftory of things obferved in Egypt, adorned with a variety of draughts of plants, ftones, and animals.

ALPINIA, in botany: A genus of the monogynia order, belonging to the monandria clafs of plants; and in the natural method ranking under the 8th order, *Scitamineæ*. The caracters are: The *calyx* is a perianthium above, fmall, and trifid: The *corolla* is monopetalous, unequal, and as if doubled: The *ftamina* confift of one filament, with linear antheræ joining to the margin: The *piftillum* has a roundifh germen, beneath; the ftylus fimple, and the ftigma obtufely trigonous: The *pericarpium* is a flefhy ovate trilocular capfule, with three valves: The *feeds* are ovate, and very numerous; the receptaculum is pulpy and very large. Of this genus there is but one fpecies, which is a native of the Weft Indies, where it grows naturally in moift places. The leaves decay every winter, and are pufhed out from the roots in the fpring, like the ginger and maranta; fo muft be managed in the fame manner as directed for thefe two plants, and may be propagated by parting the roots when the leaves decay.

Alpiste, Alps.

ALPISTE, or ALPIA, a fort of feed ufed to feed birds with, efpecially when they are to be nourifhed for breeding. The alpifte feed is of an oval figure, of a pale yellow, inclining to an ifabel colour, bright and gloffy. It is an article of the corn-chandlers and feedfmens trade.

ALPS (anc. geog.), a range of high mountains, feparating Italy from Gaul and Germany, in the form of a crefcent. They take their rife from the Vada Sabatia, or Savona; and reach to the Sinus Flanaticus (now Golfo di Carnaro of the Adriatic), and the fprings of the river Colapis (now the Kulpe); extending, accordto Livy, 2000 ftadia in length, or 250 miles: they are divided into feveral parts, and accordingly have different names. From Savona to the fprings of the Varus, where the Alps lie againft the fea of Genoa, they are called *Maritimæ*, now *le Montagne di Tenda*. Thefe extend from fouth to north, between Gaul to the weft, and Genoa to the eaft, beginning at Monaco on the Mediterranean; then running out thro' the eaft of the county of Nice, and between that and the marquifate of Saluzzo, terminate at length at mount Vifo, between Dauphine and Piedmont. Hence to Sufa run the *Alpes Cottiæ* (Sueton.); *Cottanæ* (Tacitus); mountains extremely high, feparating Dauphine from Piedmont, and extending from mount Vifo to Mount Cenis, between the *Alpes Maritimæ* to the fouth, and the *Graiæ* to the north. The *Alpes Graiæ* (Pliny), fo called from the paffage of Hercules, begin from mount Cenis, where the *Cottiæ* terminate; and run out between Savoy and the Tarentefe to the weft, and Piedmont and the Duche d'Aoufte to the eaft, quite to the Great St Bernard, where the *Alpes Penninæ* begin. They are alfo called by fome *Graiæ Alpes*, and *Graius Mons* (Tacitus); which extend from weft to eaft, between St Bernard and the Adula, or St Godart; and thus they run out between the Valefe to the north, and the Milanefe to the fouth. With thefe are continued the *Alpes Rhæticæ*, to the head of the river Piave; a part of which are the *Alpes Tridentinæ*, to the north of Trent. To thefe join the *Alpes Noricæ*, reaching to Doblach in Tyrol, to the north of the river Tajamento: thence begin the *Alpes Carnicæ*, or of *Carniola*, extending to the fprings of the Save: and the laft, called *Alpes Pannonicæ*, and *Juliæ*, extend to the fprings of the Kulpe. Some, however, extend the Alps to the north of Dalmatia; others, again, to Thrace and the Euxine. But their termination at the Kulpe, as above, is more generally received. They were formerly called *Albia*, and *Alpionia* (Strabo). Through thefe mountains Hannibal forced his paffage into Italy, by pouring vinegar on the rock, heated by burning large piles of wood on them, by which means they became crumbled (Livy). They are covered with perpetual fnow.

The ALPS are the higheft mountains in Europe; being, according to fome geometricians, about two miles in perpendicular height. They begin at the Mediterranen; and ftretching northward, feparate Piedmont and Savoy from the adjacent countries; whence directing their courfe to the eaft, they form the boundary between Switzerland and Italy, and terminate near the extremity of the Adriatic Sea, north-eaft of Venice. It was over the weftern part of thofe mountains, towards Piedmont, that Hannibal forced his paffage into Italy.

Alps.

The profpect from many parts of this enormous range of mountains is extremely romantic, efpecially towards the north-weft. One of the moft celebrated is the Grande Chartreufe, where is a monaftery founded by St Bruno about the year 1084. From Echelles, a little village in the mountains of Savoy, to the top of the Chartreufe, the diftance is fix miles. Along this courfe, the road runs winding up, for the moft part not fix feet broad. On one hand is the rock, with woods of pine trees hanging over head; on the other a prodigious precipice almoft perpendicular; at the bottom of which rolls a torrent, that, fometimes tumbling among the fragments of ftone which have fallen from on high, and fometimes precipitating itfelf down vaft defcents with a noife like thunder, rendered yet more tremendous by the echo from the mountains on each fide, concurs to form one of the moft folemn, the moft romantic, and moft aftonifhing fcenes in nature. To this defcription may be added the ftrange views made by the craggs and cliffs, and the numerous cafcades which throw themfelves from the very fummit down into the vale. On the top of the mountain is the convent of St Bruno, which is the fuperior of the whole order. The inhabitants confift of 100 fathers, with 300 fervants, who grind their corn, prefs their wine, and perform every domeftic office, even to the making of their clothes. In the Album of the fathers is admired an alcaic ode, written by the late ingenious Mr Gray when he vifited the Chartreufe, and which has fince been publifhed among his works.

The glaciers of Savoy are alfo juftly reckoned among the moft ftupendous works of nature. Thefe are immenfe maffes of ice, lodged upon the gentler declivities amidft the Alps, and exhibiting reprefentations beyond conception fantaftic and picturefque. In the extraordinary narrative of Mr Bourrit's journey hither, we meet with the following account of the Pricuré, in the valley of Chamouni. We had, fays he, the magnificent profpect of a chain of mountains, equally inacceffible, and covered with ice; and above the reft that of Mount Blanc, whofe top feemed to reach, and even pierce, the higheft region of the clouds. The chain upon which this mountain looks down like a giant, is compofed of maffes of rocks, which terminate in pikes or fpires, called the *Needles*, and which are ranged like tents in a camp. Their fides appear lighter and more airy, from the ornament of feveral hollow breaks and furrows fretted in the rock itfelf, as well as from the different ftreaks and panes of ice and fnow, which, without changing the general character of their form, or the majefty of their appearance, give them a picturefque variety. Lower down, the eye furveys with ravifhment the gills of ice, and the feveral glaciers, extending almoft into the plain, whilft this appears like an artificial garden, embellifhed with the mixture of a variety of colours. We have a picturefque oppofition to this chain, which is formed by innumerable mountains at the diftance of near 50 leagues, between whofe tops we have a glimpfe of thofe feveral plains which they environ.

M. de Sauffure, who had vifited thofe mountains about two months before M. Bourrit, felt himfelf naturally electrified in this place. This extraordinary phenomenon feems not to have been experienced by the latter or his company; but they heard a long-continued

Alps. tinued rumbling noiſe, like that of thunder, which was rendered more awful by the ſilence of the place where they ſtood. This noiſe proceeded from the ſubſequent cauſes, viz. the avalanches of ſnow, which ſeparated from the tops of the mountains, and rolled down to the bottom; conſiderable fragments of the rocks which followed them, overturning others in their fall; and maſſy blocks of ice, which precipitated from the ſummits.

The valley of Montanvert appears to be peculiarly romantic. Here, ſays M. Bourrit, we beheld a ſpacious icy plain entirely level. Upon this there roſe a mountain all of ice, with ſteps aſcending to the top, which ſeemed the throne of ſome divinity. It likewiſe took the form of a grand caſcade, whoſe figure was beyond conception beautiful; and the ſun, which ſhone upon it, gave a ſparkling brilliance to the whole. The valley on our right hand was ornamented with prodigious glaciers, that, ſhooting up to an immeaſurable height between the mountains, blend their colours with the ſkies, which they appear to reach.

Alps, beſides its proper ſignification, by which it denotes a certain chain of mountains which ſeparate Italy from France and Germany, is frequently uſed as an appellative to denote any mountains of extraordinary height or extenſive range. In this ſenſe, Auſonius and others call the Pyrenean mountains, *Alps;* and Gellius the Spaniſh Alps, *Alpini Hiſpani.*

Hence alſo we ſay, the *Britiſh Alps*, the *Aſiatic Alps*, the *Alps of America.*

The *Scottiſh Alps* terminate in a moſt ſublime and abrupt manner, at the great promontary the Alta Ripa of Ptolemy, the *Ord* or *Aird*, i. e. the *Height, of Caithneſs.* The upper part is covered with gloomy heath; the lower is a ſtupendous precipice, excavated into vaſt caverns, the haunt of ſeals and different ſea-fowl. On the eaſtern ſide of the kingdom, this is the ſtriking termination of the vaſt mountains of Scotland which form its Highlands, the habitation of the original inhabitants, driven from their ancient ſeats by the anceſtors of Lowland Scots, deſcendants of Saxons, French, and Normans; congenerous with the Engliſh, yet abſurdly and invidiouſly diſtinguiſhed from them. Language, as well as ſtriking natural boundaries, mark their place. Their mountains face on the weſt the Atlantic ocean; wind along the weſt of Caithneſs; among which Morvern and Scaraben, Ben-Hop and Ben-Lugal, ariſe pre-eminent. Sutherland is entirely Alpine, as are Roſsſhire and Inverneſsſhire. Their *Summæ Alpes* are, Meal Fourvounich, the Coryarich, Benewiſh, and Beneviſh near Fort William; the laſt of which is reported to be 1450 yards in height. Great part of Aberdeenſhire lies in this tract. It boaſts of another Morvern, ſoaring far beyond the others. This is in the centre of the Grampian hills, and perhaps the higheſt from the ſea of any in Great Britain. They again comprehend the eaſtern part of Perthſhire, and finiſh on the magnificent ſhores of Lochlomond; on the weſtern ſide of which Benlomond riſes, diſtinguiſhed among its fellows. From hence the reſt of North Britain forms a chain of humbler hills; but in Cumberland, part of Weſtmoreland, Yorkſhire, Lancaſhire, and Derbyſhire, the Alps reſume their former majeſty. A long and tame interval ſucceeds. The long ſublime tract of Wales ariſes, the ancient poſſeſſion of the ancient Britiſh race. From the Ord, the great mountains recede inland, and leave a vaſt flat between their baſes and the ſea, fronting the waves with a ſeries of lofty rocky precipices, as far as the little creek of Staxigo; the whole a bold, but moſt inhoſpitable ſhore for ſhipping. Wick and Staxigo have indeed their creeks, or rather chaſms, which open between the cliffs, and may accidentally prove a retreat, unleſs in an eaſtern gale.

The *Aſiatic Alps* are deſcribed under the articles *Altaic Chain* and *Werturian Mountains.*

The *American Alps* are, The Andes or *Cordilleras*, in South America; and the Apalachian or *Allegany* mountains, in North America.

The higheſt ground in North America is placed by Captain Carver in lat. 47° weſt long. from Lond. 98° between a lake from which the Oregon flows, and another called *White-bear Lake*, from which ariſes the Miſſiſippi.

This exalted ſituation is part of the Shining Mountains, which are branches of the vaſt chain which pervades the whole continent of America. It may be fairly taken from the ſouthern extremity, where Staten Land and Terra del Fuego riſe out of the ſea as inſulated links to an immenſe height, black, rocky, and marked with rugged ſpiry tops, frequently covered with ſnow. New Georgia may be added as another horribly congenial, riſing detached farther to the eaſt. The mountains about the Straits of Magellan ſoar to an amazing height, and infinitely ſuperior to thoſe of the northern hemiſphere under the ſame degree of latitude. From the north ſide of the Straits of Magellan, they form a continued chain through the kingdoms of Chili and Peru, preſerving a courſe not remote from the Pacific Ocean. The ſummits, in many places, are the higheſt in the world. There are not leſs than 12, which are from 2400 toiſes high to above 3000. Pichincha, which impends over Quito, is about 35 leagues from the ſea; and its ſummit is 2430 toiſes above the ſurface of the water. Cayambé, immediately under the equator, is above 3000; and Chimborazo higher than the laſt by 200. Moſt of them have been volcanic, and in different ages marked with eruptions far more horrible than have been known in other quarters of the globe. They extend from the equator through Chili; in which kingdom is a range of volcanoes, from lat. 26. ſouth, to 45. 30. and poſſibly from thence into Terra del Fuego itſelf; which, forming the Straits of Magellan, may have been rent from the continent by ſome great convulſion, occaſioned by their labourings; and New Georgia forced up from the ſame cauſe. An unparalleled extent of plain appears on their eaſtern ſide. The river of Amazons runs along a level cloathed with foreſts, after it burſts from its confinement at the Pongo of Borjas, till it reaches its ſea-like diſcharge into the Atlantic Ocean.

In the northern hemiſphere, the Andes paſs through the narrow Iſthmus of Darien into the kingdom of Mexico, and preſerve a majeſtic height and their volcanic diſpoſition. The mountain Popocatepec made a violent eruption during the expedition of Cortez, which is moſt beautifully deſcribed by his hiſtorian Antonio de Solis. This, poſſibly, is the ſame with the volcano obſerved by the Abbé d'Auteroche, in his way from Vera Cruz to Mexico; which, from the nakedneſs of the lavas, he conjectured to have been but lately

ly extinguished. From the kingdom of Mexico, this chain is continued northward, and to the east of California; then verges so greatly towards the west, as to leave a very inconsiderable space between it and the Pacific Ocean; and frequently detached branches jut into the sea, and form promontories; which, with parts of the chain itself, were often seen by our navigators in the course of their voyage. Some branches, as we have before observed, extend towards the east, but not to any great distance. A plain, rich in woods and savannas, swarming with bisons or buffaloes, stags, and Virginian deer, with bears, and great variety of game, occupies an amazing tract, from the great lakes of Canada, as low as the Gulph of Mexico; and eastward to the other great chain of mountains, the Apalachian, which are the Alps of that side of northern America. Its commencement is supposed to be about Lake Champlain and Lake George, with branches pointing obliquely to the river St Laurence eastward, and rising on its opposite coasts; others extending, with lowering progress, even into our poor remnant of the new world, Nova Scotia. The main chain passes through the province of New York, where it is distinguished by the name of the *Highlands*, and lies within 40 miles of the Atlantic. From thence it recedes from the sea, in proportion as it advances southward; and near its extremity in South Carolina is 300 miles distant from the water. It consists of several parallel ridges, divided by most enchanting vallies, and generally cloathed with variety of woods. These ridges rise gradually from the east, one above the other, to the central; from which they gradually fall to the west, into the vast plains of the Missisippi. The middle ridge is of an enormous bulk and height. The whole extends in breadth about 70 miles; and in many places leaves great chasms for the discharge of the vast and numerous rivers which rise in the bosoms of the mountains, and empty themselves into the Atlantic Ocean, after yielding a matchless navigation to the provinces they water.

Beyond the branch of the Apalachian mountains called *The Endless*, is another of amazing extent, nearly as high as the mountains themselves. This plain (called the *Upper Plains*) is exceedingly rich land; begins at the Mohock's River; reaches to within a small distance of Lake Ontario; and to the westward forms part of the extensive plains of the Ohio, and reaches to an unknown distance beyond the Missisippi. Vast rivers take their rise, and fall to every point of the compass; into Lake Ontario, into Hudson's River, and into the Delawar and Susquehanna. The tide of the Hudson's River flows thro' its deep-worn bed far up, even to within a small distance of the head of the Delawar; which, after a furious course down a long descent, interrupted with rapids, meets the tide not very remote from its discharge into the ocean.

ALPUXARRAS, or ALPAXARES, mountains of Spain, in the province of Granada, on the coast of the Mediterranean sea. They are about 17 leagues in length, and 11 in breadth, reaching from the city of Velez to Almeria. They are inhabited by Moors, who are the remains of the dispersion and ruin of their empire. They embraced the Christian religion; but preserve their own manner of living, and their language, though much corrupted. Here is a rivulet between Pitros and Portugos, which dyes linen that is dipped in it black in an instant. Near this rivulet is a cavern, from which proceeds so malignant a steam, that it destroys such animals as come near it. The Moriscos cultivate the soil extremely well, and plant fruit-trees; some of which grow to a prodigious height and thickness, and give the mountains a very agreeable aspect.

ALQUIER, a liquid measure, used in Portugal to measure oil, two of which make an almond. See ALMOND.

ALQUIFOU, or ARQUIFOU, is a sort of lead-ore, which, when broken, looks like antimony. It is used by the potters to give a green varnish to their works, and thence 'tis called potter's ore. It is met with in Cornwall, &c. The potters mix a small portion of manganese with the alquifou, and then the varnish or glazing on their ware is of a blackish hue.

ALREDUS, ALURED, or ALUREDUS, of Beverley, one of the most ancient and best English historians. He wrote in the reign of Henry I. There are no circumstances of his life known with any degree of certainty. It is generally believed that he was educated at Cambridge, and that he afterwards became one of the canons and treasurer of St John's at Beverley. And we learn in a note of bishop Tanner's, that, for the sake of improvement, he travelled through France and Italy; and that at Rome he became domestic chaplain to cardinal Othoboni. He died in the year 1128 or 1129; leaving behind him the following works: 1. *The Annals of Alured of Beverley*. Oxford, 1726. Published by Mr Hearne, from a manuscript belonging to Thomas Rawlinson, Esq. It contains an abridgment of our history from Brutus to Henry I. written in good Latin; and with great accuracy. 2. *Libertates ecclesiæ S. Johannis de Beverlac*, &c. a manuscript in the Cotton library. It is a collection of records relative to the church at Beverley, translated by our author from the Saxon language. The Biographia Britannica evidently proves these to be all that were written by Alredus.

ALRESFORD, a town of Hampshire, seated on the road from London to Southampton, close by the river Itching, which feeds a great pond to the left of the town. Part of a Roman highway runs from hence to Alton. It is a rectory, with the mediety of Old Alresford, of L.49 : 12 : 8 in the king's books. It consists of about 200 houses; has one church; two principal streets, which are large and broad; and a small manufacture of linseys.

ALSA, a river of Carniola (Pliny), now the *Ausa*; running by Aquileia, with a short course from north to south, into the Adriatic; where Constantine, the son of Constantine the Great, fighting against Constans his brother, lost his life.

ALSACE, a province of France, bounded on the east by the Rhine, on the south by Swisserland, on the west by Lorrain, and on the north by the palatinate of the Rhine. It was formerly a part of Germany, but was given to France by the treaty of Munster. It is one of the most fruitful and plentiful provinces of Europe, abounding in corn, wine, wood, flax, tobacco, pulse, fruits, &c. The mountains which divide it from Lorrain are very high; and generally covered with fir, beech, oak, and horn-beam. Those on the side of Swisserland are less high; and furnished with all sorts of

wood, as well for fuel as building. The country itfelf is diverfified with rifing hills and fertile vales, befides large forefts; but that between the rivers Ill, Hart, and the Rhine, as far as Strafburgh, is inferior to the reft, on account of the frequent overflowing of the Rhine. In High Alface there are mines of filver, copper, and lead. They however work none but thofe of Giromany, from which are annually drawn 1600 marks of filver, each mark being eight ounces; and 24,000 pounds of copper: but the expence of working them is almoft equal to the profit. There are iron-works in feveral parts of Alface, and particularly at Betford. There is a mineral fpring at Sultfbach, near Munfter, in High Alface; which is in great reputation for the palfy, weaknefs of the nerves, and the gravel.—The original inhabitants of Alface are honeft and good-natured, but wedded to their own manners and cuftoms. The fruitfulnefs of their country renders them indolent and inactive; for the Swifs make their hay and reap their corn, as well as manage the vintage of High Alface, which fends a great deal of money out of the province. The common language is the German: however, the better fort of people fpeak French in the towns; and even in the country, they fpeak French well enough to be underftood.

ALSEN, an ifland of Denmark in the leffer Belt, or entrance into the Baltic fea, between Slefwick and Funen. It is remarkable for nothing except two caftles, and producing large crops of anifeeds, a carminative much ufed in feafoning the food and mixing with the bread all over the Danifh dominions. E. Long. 10. 12. N. Lat. 55. 12.

ALSFIELD, a town of Germany, in the landgravate of Heffe Caffel, ten miles north-weft of Marpurg, and 35 fouth of Heffe Caffel. It is an ancient town, and well-built; and the inhabitants were the firft of this country who embraced the Reformation. E. Long. 9. 5. N. Lat. 50. 40.

ALSHASH, a very beautiful city in Bukharia; fuppofed to be the fame with that which is now called *Tafhcant*, the capital of the eaftern part of Turkeftan, poffeffed by the Kaffats. It is fituated on the river *Sihûn*, now *Sír*, and had a well-watered garden for every houfe; but was ruined by Jenghiz Khan, who took the city, and caufed a great number of its inhabitants to be maffacred.

ALSHEDA, a parifh of Sweden, in the province of Smaland, where a gold mine was difcovered in 1738.

ALSINA, in botany, a fynonime of the theligonum. See Theligonum.

ALSINASTRUM, in botany, the trivial name and alfo a fynonime of the elatine. See Elatine.

ALSINE, or Chickweed: A genus of the trigynia order, belonging to the pentandria clafs of plants; and, in the natural method, ranking under the 22d order, *Caryophyllei*. The characters are: The *calyx* is quinquephyllous: The *corolla* confifts of five equal petals, longer than the calyx: The *ftamina* confift of five capillary filaments; the antheræ are roundifh: The *piftillum* has an oval germen, three filiform ftyli, and obtufe ftigmata: The *pericarpium* is an ovate unilocular capfule, with three valves: The *feeds* are roundifh and numerous. Of this genus a great number of fpecies are enumerated by fome botanical writers; but none of them poffefs any remarkable properties, except the media, or common chickweed, with white bloffoms, which is fo well known as to need no particular defcription.—This fpecies affords a notable inftance of what is called the *fleep of plants*: for, every night, the leaves approach in pairs, fo as to include within their upper furfaces the tender rudiments of the new fhoots; and the uppermoft pair but one at the end of the ftalk are furnifhed with longer leaf-ftalks than the others; fo that they can clofe upon the terminating pair, and protect the end of the branch. The young fhoots and leaves, when boiled, can hardly be diftinguifhed from fpring fpinach. They are deemed refrigerating and nutritive, and an excellent food for perfons of a confumptive habit of body.—Swine are extremely fond of chickweed; cows and horfes eat it; fheep are indifferent to it; and goats refufe it.

ALSIRAT, in the Mahometan theology, denotes a bridge laid over the middle of hell, finer than a hair, and fharper than the edge of a fword, over which people are to pafs, after their trial, on the day of judgement. To add to the difficulty of the paffage, Mahomet affures, that the alfirat, narrow as it is, is befet with briars and thorns; none of which, however, will be any impediment to the good, who fhall fly over it like the wind; Mahomet and his muffulmen lead the way; whereas the wicked, by the narrownefs of the path, the entangling of the thorns, and extinction of the light which directed the former to paradife, will foon mifs their footing, and tumble headlong into hell, which is gaping beneath to receive them.

ALSIUM, a city of ancient Etruria, occupying (according to Cluverius) the fpot on which *Pala* now ftands. We are told by Dionyfius Halicarnaffenfis, that Alfium was built by the Aborigines, long before the Tyrfenians invaded Italy. In this cafe it muft have been founded not long after the difperfion in the days of Peleg. Its founder is faid to have been one *Alæfus*, *Alefus*, or *Alifa*; whom fome conjecture to have been Alifah, or Elifha, the fon of Javan, mentioned in fcripture.

ALSOP (Anthony), a divine and poet, was educated at Weftminfter-fchool, and thence elected to Chrift-church, Oxford, where he took the degree of M. A. in March 1696, and of B. D. in Decem. 1706. On his coming to the univerfity, he was very foon diftinguifhed by Dean Aldrich, and publifhed *Fabularum Æfopicarum Delectus*, Oxon. 1698, 8vo. with a poetical dedication to lord vifcount Scudamore, and a preface in which he took part againft Dr Bentley in the famous difpute with Mr Boyle. He paffed through the ufual offices in his college to that of cenfor with confiderable reputation; and for fome years had the principal noblemen and gentlemen belonging to the fociety committed to his care. In this employment he continued till his merit recommended him to Sir Jonathan Trelawney, bifhop of Winchefter, who appointed him his chaplain, and foon after gave him a prebend in his own cathedral, together with the rectory of Brightwell in the county of Berks, which afforded him ample provifion for a learned retirement, from which he could not be drawn by the repeated folicitations of thofe who thought him qualified for a more public character and a higher ftation. In 1717 an action was brought againft him by Mrs Elizabeth Aftrey of Oxford, for a

breach of a marriage-contract; and a verdict obtained against him for 2000 l. which probably occasioned him to leave the kingdom for some time. His death, which happened June 10, 1726, was occasioned by his falling into a ditch that led to his garden-door. A quarto volume was published in 1752, under the title of *Antonii Alsopi, Ædis Christi olim Alumni Odarum libri duo.* Four English poems of his are in Dodsley's Collection, one in Pearch's, several in the early volumes of the Gentleman's Magazine, and some in "The Student." Mr Alsop is respectfully mentioned by the facetious Dr King of the Commons (vol. I. p. 236), as having enriched the commonwealth of learning, by "Translations of Fables from Greek, Hebrew, and Arabic;" and not less detractingly by Dr Bentley, under the name of "Tony Alsop, a late editor of the Æsopean Fables."

Alsop (Vincent), an eminent divine, was educated in St John's college in Cambridge, where he took the degree of Master of Arts. He received deacon's orders from a bishop, after which he went down into Rutlandshire, and settled at Oakham, where he was an assistant to the master of the free-school. As he was a man of a sprightly turn, he fell there into indifferent company; but was reclaimed by the frequent admonitions of the reverend Mr Benjamin King. He afterwards married that gentleman's daughter, and becoming a convert to his principles, received ordination in the Presbyterian way, not being satisfied with that which he had from the bishop. He was settled at Wilbee in the county of Northampton, whence he was ejected in 1662, for nonconformity. After this he ventured to preach sometimes at Oakham, and at Wellingborough where he lived, and was once six months in prison for praying by a sick person. A book he wrote against Dr Sherlock in a humorous style, made him well known to the world, and induced Mr Cawton, an eminent nonconformist in Westminster, to recommend him to his congregation for his successor. On receiving this call, he quitted Northamptonshire and came to London, where he preached constantly, and wrote several pieces which were extremely well received by the public. His living in the neighbourhood of the court exposed him to many inconveniences; but these ended with the reign of Charles II. or at least in the beginning of the next reign, when Mr Alsop's son engaging in treasonable practices was freely pardoned by king James. After this our divine went frequently to court, and is generally supposed to have been the person who drew the Presbyterian's address to that prince for his general indulgence. After the Revolution, Mr Alsop gave very public testimonies of his affection for the government; yet upon all occasions he spoke very respectfully of king James, and retained a very high sense of his clemency in sparing his only son. The remainder of his life he spent in the exercise of his ministry, preaching once every Lord's day; besides which he had a Thursday lecture, and was one of the lecturers at Pinner's hall. He lived to be a very old man, and preserved his spirits to the last. On grave subjects he wrote with a becoming seriousness; but where wit might properly be shown, he displayed his to great advantage. His funeral sermon was preached by Mr Slater, and his memory will be always preserved by his own learned and elegant writings. Of these the most remarkable, besides his sermons, are, 1. *Antisozzo;* in vindication of some great truths opposed by Dr William Sherlock, 8vo, 1675. 2. *Melius Inquirendum;* in answer to Dr Goodman's Compassionate Inquiry, 8vo, 1679. 3. The Mischief of Impositions; in answer to Dr Stillingfleet's Mischief of Separation, 1680. 4. A Faithful Reproof to a False Report, with reference to the Differences among the United Ministers in London, 8vo.

ALSTEDIUS (John-Henry), a German Protestant divine, and one of the most indefatigable writers of the 17th century. He was some time professor of philosophy and divinity at Herborn in the county of Nassau: from thence he went into Transylvania, to be professor at Alba Julia; where he continued till his death, which happened in 1638, being then 50 years of age. His *Encyclopedia* has been much esteemed even by the Roman Catholics; it was printed at Lyons, and sold very well throughout all France. His *Thesaurus Chronologicus* is by some esteemed one of his best works, and has gone through several editions. He also wrote *Triumphus Biblicus,* to show that the principles of all arts and sciences are to be found in the Scriptures; but he gained very few to his opinion. He was a Millenarian; and published, in 1627, a treatise *De mille annis,* in which he asserted that the reign of the saints on earth was to begin in 1694.

ALSTON-MORE, a town in Cumberland, seated on a hill, at the bottom of which runs the river Tyne, with a stone bridge over it. Near this place is plenty of lead-ore. W. Long, 2. 4. N. Lat. 54. 45.

ALSTONIA, in botany; a genus of the monogynia order, belonging to the hexandria class of plants. The characters are: The *calyx* is a perianthium beneath, imbricated: The *corolla* is monopetalous, and shorter than the calyx; the border expanding, eight or ten parted, with alternate divisions: The *stamina* consist of numerous short filaments, the exterior ones longer; the antheræ are orbicular and furrowed: The *pistillum* has a small ovate germen above; a simple stylus the length of the corolla, filiform and erect; the stigma inverse egg-headed. There is but one species, the theaformis, a native of America.

ALSTROEMERIA, in botany: A genus of the monogynia order belonging to the hexandria class of plants; and, in the natural method, ranking under the 11th order, *Sarmentaceæ.* The characters are: There is no *calyx:* The *corolla* is nearly bilabiated; and consists of six petals, the two inferior tubular at the base: The *stamina* consist of six subulated filaments, declining and unequal; the antheræ oblong: The *pistillum* has an hexangular germen beneath; the stylus declining, filiform, the length of the stamina; and three oblong bifid stigmata: The *pericarpium* is a roundish hexangular capsule, with three cells and three valves: The *seeds* are globular and numerous. There are five species, natives of Italy and Peru.

ALT, in music, a term applied to the high notes in the scale.

ALTAIC Chain, a range of mountains which bounds Asia on the south. It begins at the vast mountain Bogdo, passes above the head of the Irtisch, and then takes a course rugged, precipitous, clothed with snow, and rich in minerals, between the Irtisch and Ob;

Ob; then proceeds by the lake Telezkoi, the riſe of the Ob; after which it retires, in order to comprehend the great rivers which form the Jeneſei, and are locked up in theſe high mountains; finally, under the name of the *Sainnes*, is uninterruptedly continued to the lake of Baikal. A branch inſinuates itſelf between the ſources of the rivers Onon and Ingoda, and thoſe of Ichikoi, accompanied with very high mountains, running without interruption to the north-eaſt, and dividing the river of Amur, which diſcharges itſelf into the eaſt, in the Chineſe dominions, from the river Lena and lake Baikal. Another branch ſtretches along the Olecma, croſſes the Lena below Jakoutſk, and is continued between the two rivers Tongouſka to the Jeneſei, where it is loſt in wooded and moraſſy plains. The principal chain, rugged with ſharp-pointed rocks, approaches and keeps near the ſhores of the ſea of Ockhozt, and paſſing by the ſources of the rivers Outh, Aldan, and Maia, is diſtributed in ſmall branches, which range between the eaſtern rivers which fall into the Icy Sea; beſides two principal branches, one of which, turning ſouth, runs through all Kamtſchatka, and is broken, from the cape Lopatka, into the numerous Kurile iſles, and to the eaſt forms another marine chain, in the iſlands which range from Kamtſchatka to America; moſt of them, as well as Kamtſchatka itſelf, diſtinguiſhed by fierce vulcanoes, or the traces of vulcanic fires. The laſt chain forms chiefly the great cape Tſchutſki, with its promontories and rocky broken ſhores.

ALTAMONT, a very handſome town of Italy, in the kingdom of Naples, and in Calabria Citerior, 15 miles north-weſt of Baſigniano. E. Long. 16. 22. N. Lat. 39. 40.

ALTAMURA, a town of Naples, in the territory of Bari, with the title of a principality, ſeated on the foot of the Apennine mountains. E. Long. 16. 54. N. Lat. 41. 0.

ALTAR, a place upon which ſacrifices were anciently offered to ſome deity.

The heathens at firſt made their altars only of turf; afterwards they were made of ſtone, of marble, of wood, and even of horn, as that of Apollo in Delos.

Altars differed in figure as well as in materials. Some were round, others ſquare, and others triangular. All of them were turned towards the eaſt, and ſtood lower than the ſtatues of the gods; and were generally adorned with ſculpture, repreſenting either the gods to whom they were erected, or their ſymbols. See the PAGAN ALTARS repreſented on Plate XI. Upon the ſides of N° 1. a trident and two dolphins are exhibited, which denote it to have been dedicated to Neptune. N° 2. a four-ſquare altar, was dedicated to the nymphs, as the inſcription imports. N° 3. exhibits a Bacchanal holding a thyrſus in his hand, a mark of the altar's being built to Bacchus: it had two other ſides, which made it appear triangular. Of N° 4. which was alſo triangular, each face or ſide exhibited a genius, one of whom (on the ſide repreſented) carries an oar upon his neck, which ſeems to denote it an altar of Neptune. N° 5. an altar of a round ſhape, is inſcribed *Ara Neptuni:* the god himſelf is there repreſented, all naked, ſaving the pallium upon his ſhoulder; and holding in his left hand a trident, and in his right a dolphin.

The height of altars alſo differed according to the different gods to whom they ſacrificed. According to Servius, thoſe altars ſet apart for the honour of the celeſtial gods, and gods of the higher claſs, were placed on ſome pretty tall pile of building; and for that reaſon were called *altaria*, from the words *alta* and *ara*, "a high elevated altar." Thoſe appointed for the terreſtrial gods were laid on the ſurface of the earth, and called *aræ*. And, on the contrary, they dug into the earth and opened a pit for thoſe of the infernal gods, which they called βοθροι λακκοι, "ſcrobiculi." But this diſtinction is not every where obſerved: the beſt authors frequently uſe *ara* as a general word, under which are included the altars of the celeſtial and infernal, as well as thoſe of the terreſtrial, gods. Witneſs Virgil, Ecl. 5.

——*En quatuor aras.*

Where *aræ* plainly includes *altaria;* for whatever we make of Daphnis, Phœbus was certainly a celeſtial god. So Cicero, pro Quint. *Aras delubraque Hecates in Græcia vidimus.* The Greeks alſo diſtinguiſhed two ſorts of altars; that whereon they ſacrificed to the gods was called βωμος, and was a real altar, different from the other whereon they ſacrificed to the heroes, which was ſmaller, and called εσχαρα. Pollux makes this diſtinction of altars in his Onomaſticon; he adds, however, that ſome poets uſed the word εσχαρα for the altar whereon ſacrifice was offered to the gods. The Septuagint verſion does ſometimes alſo uſe the word εσχαρα for a ſort of little low altar, which may be expreſſed in Latin by *craticula;* being a hearth rather than an altar.

Before temples were in uſe, altars were erected ſometimes in groves, ſometimes in the highways, and ſometimes on the tops of mountains; and it was a cuſtom to engrave upon them the name, enſign, or character, of the deity to whom they were conſecrated.

In the great temples of ancient Rome there were ordinarily three altars: The firſt was placed in the ſanctuary, at the foot of the ſtatue of the divinity, upon which incenſe was burnt and libations offered; the ſecond was before the gate of the temple, and upon it they ſacrificed the victims; and the third was a portable altar, upon which were placed the offering and the ſacred veſſels.

Beſides theſe uſes of altars, the ancients ſwore upon them, and ſwore by them, in making alliances, confirming treaties of peace, and other ſolemn occaſions. Altars alſo ſerved as places of refuge to all thoſe who fled to them, whatever crime they had committed.

Altars are doubtleſs as ancient as ſacrifices themſelves; conſequently their origin is not much later than that of the world; Gen. ch. iv. Some attribute their origin to the Egyptians; others to the Jews; others to the patriarchs before the flood. Some carry them as far back as Adam, whoſe altar is much ſpoken of by Jewiſh, and even Chriſtian writers. Others are contented to make the patriarch Enoch the firſt who conſecrated a public altar. Be this as it will, the earlieſt altars we find any expreſs teſtimony of are thoſe erected by Abraham.

Altars, in the patriarchal times, were very rude. The altar which Jacob ſet up at Beth-el was nothing but a ſtone, which ſerved him inſtead of a bolſter; that of Gideon, a ſtone before his houſe: and the firſt which

Altar.

God commanded Mofes to erect was probably of earth, or unpolifhed ftones, without any iron; for if any ufe was made of that metal, the altar was declared impure.

The principal altars of the Jews were, The altar of *incenfe*; that of *burnt-offering*; and the *altar*, or *table*, *for the fhew-bread*.

The *altar of incenfe* was a fmall table of fhittim-wood, covered with plates of gold, of one cubit in length, another in width, and two in height. At the four corners, were four kinds of horns, and all round a little border or crown over it. This was the altar hidden by Jeremiah before the captivity; and upon it the officiating prieft offered, every morning and evening, incenfe of a particular compofition. See Plate XI.

The *altar of burnt-offerings* was made of fhittim-wood, and carried upon the fhoulders of the priefts by ftaves of the fame wood overlaid with brafs. In the time of Mofes, this altar was five cubits fquare and three high; but in Solomon's temple it was much larger, being 20 cubits fquare and 10 in height. It was covered with brafs; and at each corner was a horn or fpire, wrought out of the fame wood with the altar, to which the facrifices were tied. Within the hollow was a grate of brafs, on which the fire was made; through it fell the afhes, and were received in a pan below. At the four corners of the grate were four rings and four chains, which kept it up at the horns. This altar was placed in the open air, that the fmoke of the burnt-offerings might not fully the infide of the tabernacle. See Plate XI.

The *altar*, or *table*, for the *fhew-bread*, was likewife of fhittim-wood, covered with plates of gold, having a little border round it, adorned with fculpture. It was two cubits long, one wide, and one and an half in height. Upon this table, which ftood in the holy of holies, were put, every fabbath-day, 12 loaves, with falt and incenfe.

The Jewifh altars, after their return from the captivity, and the building of the fecond temple, were in fome refpects different from thofe defcribed above. That of burnt-offerings was a large pile, built of unhewn ftone, 32 cubits fquare at the bottom, and 24 fquare at the top. The afcent was by a gentle rifing, 32 cubits in length, and 16 in breadth.

Altar, is alfo ufed among Chriftians for the communion-table.

In the primitive church, the altars were only of wood; as being frequently to be removed from place to place. But the council of Paris, in 509, decreed that no altar fhould be built but of ftone.—At firft there was but one altar in each church; but the number foon increafed; and from the writings of Gregory the Great, who lived in the fixth century, we learn, that there were fometimes in the fame church 12 or 13. In the cathedral of Magdeburg there are no lefs than 49 altars.

The altar is fometimes fuftained on a fingle column, as in the fubterraneous chapels of St Cecilia, at Rome, &c.; and fometimes by four columns, as the altar of St Sebaftian of Crypta Arenaria; but the cuftomary form is, to be a maffive of ftone-work, fuftaining the altar-table. Thefe altars bear a refemblance to tombs: to this purpofe, we read in church-hiftory, that the primitive Chriftians chiefly held their meeting at the tombs of the martyrs, and celebrated the myfteries of religion upon them; for which reafon, it is a ftanding rule to this day in the church of Rome, never to build an altar, without inclofing the relics of fome faint in it.

Altar-thane ‖ Altenburg.

ALTAR-THANE, or ALTARIST, in old law-books, an appellation given to the prieft or parfon of a parifh, to whom the altarage belonged. See ALTARAGE.

ALTARAGE, in law, altars erected in virtue of donations, before the Reformation, within a parochial church, for the purpofe of finging of mafs for deceafed friends.

ALTARAGE likewife fignifies the profits arifing to the prieft on account of the altar.

AL-TAYEFF, a town of Hejaz, a diftrict of Arabia Felix. It is fituated about 60 miles eaft of Mecca, behind mount Gazwan, where the cold is more intenfe than in any other part of the diftrict, but the air very wholefome. Its territory abounds in fountains, and produces excellent raifins. The town is furrounded with a wall, but is not very large.

ALTDORF, a large handfome town in Swifferland, and the chief of the canton of Uri. It is fituated below the lake of the four cantons, in a plain, at the foot of a mountain, whofe paffages are difficult, and ferve inftead of fortifications. It has four churches and two convents; St Martin's church and that of the Holy Crofs are the fineft. The town-houfe and the arfenal are alfo worth feeing. E. Long. 8. 30. N. Lat. 46. 50.

ALTEA, a fea-port town of Valencia, in Spain. It was taken in 1705, in favour of the archduke Charles; but loft after the battle of Almanza. W. Long. 0. 15. N. Lat. 46. 34.

ALTEMBURG, a town of Tranfylvania, 17 miles S. W. of Wifemburg, and 35 S. of Claufenbourg. E. Long. 23. 5. N. Lat. 46. 25.

ALTENA, a fea-port town of Germany, in the duchy of Holftein, in Lower Saxony. It is a modern town, built by the king of Denmark, and was burnt by the Swedes in 1712; but has fince been beautifully re-built. The merchandife brought from Afia, by the Danifh Eaft-India company, is fold here. E. Long. 10. 0. N. Lat. 53. 51.

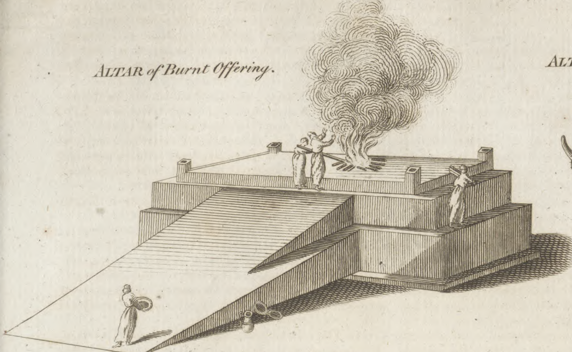
ALTENBERG, an ancient town of Germany, fituated on the river Pleifs, with a good caftle placed on a rock, in Mifnia, in the circle of the Upper Saxony. It was formerly an Imperial city, but at prefent belongs to the houfe of Saxony. Here is a college which has always been in a flourifhing condition. In 1705, there was a nunnery founded for women of a high rank, who are Proteftants. E. Long. 15. 8. N. Lat. 50. 59.

ALTENBURG, a fmall fortified town of Hungary, in the territory of Mofon, near the Danube, about 55 miles from Vienna. E. Long. 35. 30. N. Lat. 48. 15.

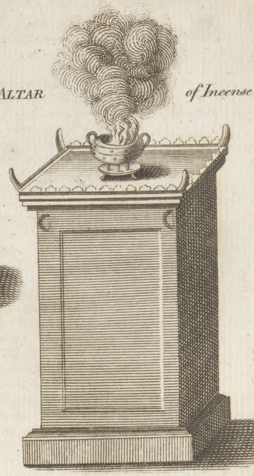
ALTENBURG, or OWAR, a fmall but ftrong town of Hungary, feated in a marfh, with wide ftreets. It is near the river Danube, and is furrounded with deep ditches. It is 15 miles fouth of Prefburg, 40 fouth-eaft of Vienna, and 65 fouth-weft of Buda. E. Long. 17. 56. N. Lat. 44. 0.

Jewish ALTARS.

ALTAR of Burnt Offering.



ALTAR of Incense.



Pagan ALTARS.

1

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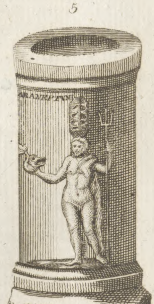

A.Bell PRIN.WAL. SCULPTOR fecit.

ALTERANTS, or *Alterative Medicines*, ſuch as correct the bad qualities of the blood and other humours, without occaſioning any ſenſible evacuation.

ALTERATION, in phyſics, the act of changing the circumſtances and manner of a thing; its general nature and appearance remaining the ſame. Or, it is an accidental and partial change in a body; without proceeding ſo far as to make the ſubject quite unknown, or to take a new denomination thereupon.—Or, it may be defined, the acquiſition or loſs of ſuch qualities as are not eſſential to the form of the body. Thus, a piece of iron, which before was cold, is ſaid to be *altered*, when it is made hot; ſince it may ſtill be perceived to be iron, is called by that name, and has all the properties thereof. By this *alteration* is diſtinguiſhed from *generation* and *corruption;* thoſe terms expreſſing an acquiſition or loſs of the eſſential qualities of a thing.—The modern philoſophers, after the ancient chemiſts and corpuſcularians, hold all *alteration* to be effected by means of local motion. According to them, it always conſiſts either in the emiſſion, acceſſion, union, ſeparation, or tranſpoſition, of the component particles.

ALTERCATION, a debate or conteſt between two friends or acquaintance. The word comes from *altercari*, which anciently ſignified to converſe or hold diſcourſe together.—Thus, we ſay, They never come to an open quarrel, but there is continually ſome little *altercation* or other.

ALTERN-base, in trigonometry, a term uſed in contradiſtinction to the true baſe. Thus in oblique triangles, the true baſe is either the ſum of the ſides, and then the *difference* of the ſides is called the *altern-baſe;* or the true baſe is the difference of the ſides, and then the *ſum* of the ſides is called the *altern-baſe*.

ALTERNATE, in a general ſenſe, a term applied to ſuch perſons or things as ſucceed each other by turns. Thus, two who command each his day, are ſaid to have an alternate command, or to command alternately.

Alternate, in heraldry, is ſaid in reſpect of the ſituation of the quarters. Thus the firſt and fourth quarters, and the ſecond and third, are uſually of the ſame nature, and are called *alternate quarters*.

Alternate, in botany, when the leaves or branches of plants ariſe higher on oppoſite ſides alternately.

ALTERNATION, in its primary ſenſe, denotes a ſucceſſion by turns.

Alternation is ſometimes uſed to expreſs the different changes or alterations of orders in any number of things propoſed. This is alſo called *permutation*, &c. and is eaſily found by a continual multiplication of all the numbers, beginning at unity. Thus, if it be required to know how many changes or alternations can be rung on ſix bells, multiply the numbers 1, 2, 3, 4, 5, 6, continually into one another; and the laſt product gives the number of changes.

ALTERNATIVE, is particularly uſed for the choice of two things propoſed. In this ſenſe we ſay, to take the *alternative* of two propoſitions.

ALTHÆA, Marshmallow: A genus of the polyandria order, belonging to the monodelphia claſs of plants; and, in the natural method, ranking under the 37th order, *Columniferæ*. The characters are: The *calyx* is a double perianthium, the exterior one nine-cleft: The *corolla* conſiſts of five petals, coaleſced at the baſe: The *ſtamina* conſiſt of numerous filaments inſerted into the corolla; the antheræ are kidney-ſhaped. The *piſtillum* has an orbicular germen; a ſhort cylindrical ſtylus; and numerous briſtly ſtigmata, the length of the ſtylus: The *pericarpium* conſiſts of numerous arillæ: The *ſeeds* are ſolitary, and kidney-ſhaped. There are three

Species. 1. The vulgaris, or common marſhmallow, is a native of Britain, and hath a perennial root, and an annual ſtalk, which periſhes every autumn. The ſtalks grow erect to the height of four or five feet. Theſe are garniſhed with leaves which are hoary, ſoft to the touch, and placed alternately on the branches. The flowers come out from under the wings of the leaves, like the mallow, and are of a purpliſh white. 2. The hirſuta, or hairy marſhmallow, is a native of Spain and Portugal. It is a low plant, whoſe branches trail on the ground, unleſs they are ſupported by ſtakes. The leaves and ſtalks are beſet with ſtrong hairs, the flowers come out like thoſe of the common ſort, but are ſmaller, and have purpliſh bottoms. 3. The cannabina, or ſhrubby marſhmallow, is a native of Hungary and Iſtria. It has a woody ſtem, which riſes to the height of four or five feet; and puts out many ſide-branches. The flowers come out in the ſame manner as in the others, but are of a deeper red colour. This ſort ſeldom flowers the firſt year, unleſs the ſummer proves warm; but when the plants live through the winter, they will flower early in the following ſummer, and produce good ſeeds.

Culture. Though the firſt ſort is found naturally in ſalt marſhes, it will thrive when tranſplanted into any ſoil, or in any ſituation; however, it will always grow larger in moiſt than in dry ſoil. It may be propagated either by parting the roots in autumn when the ſtalks decay, or by ſowing the ſeeds in the ſpring. If the ſeeds of the ſecond ſpecies are ſown in April, the plants will flower in July, and carry ripe ſeed in September. They ought to be ſown in the places where they are to remain, as the roots ſhoot deep in the ground; ſo that unleſs the plants are removed very young, they ſeldom ſurvive it. The ſeeds of the cannabina ought alſo to be ſown where the plants are to remain, for the reaſon juſt now given. They ſhould have a ſheltered ſituation and a dry ſoil, otherwiſe they will not live through the winter. Indeed they ſeldom continue in this country above two years, with all the care that can be taken of them.

Medicinal Uſes. The firſt is the only ſpecies uſed in medicine. The whole plant, eſpecially the root, abounds with a mild mucilage. It has the general virtues of an emollient medicine; and proves ſerviceable in a thin acrimonious ſtate of the juices, and where the natural mucus of the inteſtines is abraded. It is chiefly recommended in ſharp defluxions upon the lungs, hoarſeneſs, dyſenteries; and likewiſe in nephritic and calculous complaints: not, as ſome have ſuppoſed, that this medicine has any peculiar power of diſſolving or expelling the calculus; but as, by lubricating and relaxing the veſſels, it procures a more free and eaſy paſſage. The root is ſometimes employed externally for ſoftening and maturating hard tumours; chewed, it is ſaid to give eaſe in difficult dentition of children.

This root gave name to an officinal ſyrup, decoction,

tion, and ointment; and was likewife an ingredient in the compound powder of gum tragacanth and the oil and plafter of mucilages. But of all thefe formulæ the fyrup alone is now retained.

Althæa Frutex. See Hibiscus.

ALTIMETRY, the art of meafuring altitudes or heights, whether acceffible or inacceffible. See Geometry.

ALTIN, a money of account in Mufcovy, worth three *copecs*; one hundred of which make a ruble, worth about 4s. 6d. fterling.

ALTIN, a lake in Siberia, from whence iffues the river Ob, or Oby, in N. Lat. 52. 0. E. Long. 85°. 55′. This lake is called by the Ruffians *Telofkoi Ofero*, from the Teleffi, a Tartarian nation, who inhabit the borders of it, and who give it the name of *Altin-Kul*. By the Calmucks it is called *Altinnor*. It is near ninety miles long and 50 broad, with a rocky bottom. The north part of it is fometimes frozen fo hard as to be paffable on foot, but the fouthern part is never covered with ice. The water in the Altin lake, as well as in the rivers which run through the adjacent places, only rifes in the middle of fummer, when the fnows on the mountains are melted by the heat of the fun.

ALTINCAR, among mineralifts, a fpecies of factitious falt ufed in the fufion and purification of metals.

The altincar is a fort of flux powder. Divers ways of preparing it are given by Libavius.

ALTING (Henry), profeffor of divinity at Heidelberg and Groningen, was born at Embden in 1583, of a family which had been long confpicuous in Frifeland. His father, Menfo Alting, was the firft, who, with two others, preached the reformation in the territory of Groningen, about the year 1566, under the tyrannical government of the duke of Alva; and the firft that preached in the great church of Groningen, after the reduction of that town by the States General in 1594. Henry was chofen, in 1605, preceptor to the three young counts of Naffau, Solms, and Izenberg. After various difficulties, he fettled at Groningen, where he continued till his death, Auguft 25. 1644. He was a found proteftant divine, a pious Chriftian, a ufeful member of fociety in many refpects, and one who fuffered much for the truth. Moft of his works were never publifhed; thofe which have been are the following: *Notæ in decadem problematum J. Behm*, 1618. *Loci communes explicatio catechefeos Palatinæ*, 1646, in 3 vols. *Exegefis Auguftanæ confef.* 1647. *Methodus theologiæ*, 1650. It appears from the catalogue of his works annexed to his life, that the *Medulla hift. prophanæ*, publifhed by Dr Pareus, was compofed by Alting. The moft remarkable piece among Alting's MMS. is, The ecclefiaftical hiftory of the Palatinate, from the reformation to the adminiftration of John Cafimir.

Alting (James), fon of the former, was born at Heidelberg in 1618. He travelled into England in 1640, where he was ordained by the learned Dr Prideaux, bifhop of Worcefter. He afterwards accepted of the profefforfhip of Groningen, vacant by the death of Gomarus; but his fituation was rendered very difagreeable by the continual difputes which he had with his colleague Sam. des Marets, who favoured the fchool-divinity. He died in 1697. He recommended the edition of his works to Menfo Alting (author of *Notitia German. Infer. Antiquæ*, fol. Amft. 1679); but they were publifhed in 5 vols. folio, with his life, by Mr Bekker of Amfterdam. They contain various analytical, exegetical, practical, problematical, and philofophical tracts, which fhow his great induftry and knowledge. Alting was a divine greatly addicted to the text of the fcripture, to Cocceianifm, and Rabbinifm. He preached well in German, Dutch, and Englifh.

ALTITUDE, acceffible, and inacceffible. See Geometry.

The method of taking confiderable terreftrial altitudes, of which thofe of mountains are the greateft, by means of the barometer, is very eafy and expeditious. It is done by obferving, on the top of the mountain, how much the mercury has fallen below what it was at the foot of the mountain. See Barometer.

Altitude of the Eye, in perfpective, is a right line let fall from the eye, perpendicular to the geometrical plane.

Altitude, in aftronomy, is the diftance of a ftar, or other point, in the mundane fphere, from the horizon.

This altitude may be either *true* or *apparent*.—If it be taken from the rational or real horizon, the altitude is faid to be true or real; if from the apparent or fenfible horizon, the altitude is apparent.—Or rather, the apparent altitude is fuch as it appears to our obfervation; and the *true* is that from which the refraction has been fubtracted.

The true altitudes of the fun, fixed ftars, and planets, differ but very little from their apparent altitudes; becaufe of their great diftance from the centre of the earth, and the fmallnefs of the earth's femidiameter, when compared thereto. But the difference between the true and apparent altitude of the moon is about 52′. This fubject is further explained under Astronomy.

Altitude Inftrument, or *Equal Altitude Inftrument*, is that ufed to obferve a celeftial object when it has the fame altitude on the eaft and weft fides of the meridian. See Astronomy, the laft fection.

ALTKIRK, a town of Alface in Germany, fituated on the river Ill, in N. Lat. 47. 40. and E. Long. 7. 15.

ALTMORE, a town of Ireland, in the county of Tyrone, and province of Ulfter, fituated in N. Lat. 54. 34, and W. Long. 7. 2.

ALTON, a town in Hampfhire, feated on the river Wey; W. Long. 0. 46. N. Lat. 51. 5. It is governed by a conftable; and confifts of about 300 houfes, indifferently built, chiefly laid out in one pretty broad ftreet. It has one church, a Prefbyterian, and a Quaker's meeting, a famous free fchool, a large manufacture of plain and figured baragons, ribbed druggets, and ferges de Nifmes; and round the town is a large plantation of hops.

Alton, or Avelton, a village in Staffordfhire, five miles north of Utoxeter. There are the ruins of a caftle here, which fome would have to be built before the Norman conqueft; but Dr Plott is pretty certain that it was erected by Theobald de Verdun, in the beginning of the reign of Edward II. A great part of the walls are ftill ftanding, but they are in a very ruinous condition.

ALTO *et Basso*, or *in Alto & in Basso*, in law, fignifies

Alto ‖ Alvares.

fignifies the abfolute reference of all differences, fmall and great, high and low, to fome arbitrator or indifferent perfon.—*Pateat univerfis per præfentes, quod Willielmus Tylar de Yetton, & Thomas Gower de Almeftre, pofuerunt fe in* Alto & *in* Baffo, *in arbitrio quatuor hominum;* viz. *de quadam querela pendente inter eos in curia.—Nos & terram noftram* altè & baffè *ipfius domini Regis fuppofuimus voluntati.*

Alto-Relievo. See Relievo.

Alto-Ripieno, in mufic, the tenor of the great chorus which fings and plays only now and then in fome particular places.

ALTORF, a town of the circle of Franconia, in Germany. It has a phyfic garden, with 2000 different plants; a theatre for diffections, which has many curiofities in the anatomical way; and a handfome library. It is fubject to the houfe of Brandenburg; and is feated on the confines of Bavaria, 15 miles from Nuremberg. E. Long. 9. 35. N. Lat. 47. 46.

ALT-RANSTADT, a town in Saxony, famous for the treaty between Charles XII. king of Sweden and Auguftus elector of Saxony, in 1706, wherein the latter refigned the kingdom of Poland.

ALTRINGHAM, a town of Chefhire in England, upon the borders of Lancafhire, feven miles from Manchefter. W. Long. 1. 30. N. Lat. 53. 25.

ALTZEG, a town of Germany in the Lower Palatinate, the capital of a territory of the fame name, with an old caftle. W. Long. 7. 25. N. Lat. 49. 44.

ALVA de Tormes, a confiderable town in Spain, in the kingdom of Leon, and territory of Salamanca, with a very handfome caftle. It is feated on the north bank of the river Tormes. W. Long. 6. 1. N. Lat. 41. 0.

ALVAH, the wood wherewith Mofes fweetened the waters of Marah, Exod. ch. xv. ver. 25.—The name of this wood is not found in fcripture; but the Mahometans give it that of *alvah*, and pretend to trace its hiftory from the patriarchs before the flood. Jofephus, on the contrary, fays, that Mofes ufed the wood which he found next lying before him.

ALVARES de luna, or as fome call him Alvaro, is a character too edifying to be omitted in this work. He was the favourite of John II. king of Caftile: was famous for the prodigious afcendancy he gained over this prince, and for the punifhment which at length overtook him. He was natural fon of Don Alvaro de Luna, lord of Canete in Arragon, and of a woman infamous for unbounded luft. He was born in 1388, and named Peter; but Pope Benedict XIII. who was charmed with his wit tho' yet a child, changed Peter to Alvares. He was introduced to court in 1408, and made a gentleman of the bedchamber to king John, with whom he grew into the higheft favour. In 1427 he was obliged to retire: the courtiers exerted all their endeavours to ruin him: they complained, that a man of no military fkill, of no virtues whatever, fhould, by mere artifice and diffimulation, be advanced to the higheft authority; and they could not bear that, by the affiftance of a few upftart men, whom he had raifed and fixed to his intereft, he fhould reign as abfolutely as if he were king.

They prevailed againft him, and Alvares was banifhed from court a year and an half: but this was the greateft affliction imaginable to the king; who fhowed all marks of diftrefs the moment he was removed from his prefence, and now thought and fpoke of nothing but Alvares. He was therefore recalled; and, being invefted with his ufual authority, revenged himfelf feverely upon his enemies, by perfuading the king to banifh them. Of the 45 years he fpent at court, he enjoyed for 30 of them fo entire an afcendancy over the king, that nothing could be done without his exprefs orders: nay, it is related by Mariana, that the king could not change an officer or fervant, or even his clothes or diet, without the approbation of Alvares. In fhort, he wanted nothing to complete his grandeur but the name of king: he had all the places in the kingdom at his difpofal; he was mafter of the treafury, and by bounties had fo gained the hearts of the fubjects, that the king, though his eyes now were opened, and his affections fufficiently turned againft him, durft not complain.

But the day of reckoning was approaching, and at length he was feized; yet not directly, openly, and violently, but with fome of that management which upon a fimilar occafion was formerly employed by Tiberius againft Sejanus. During his confinement, he made feveral attempts to fpeak to the king in perfon; but not being able to effect this, he fent the following letter, from which, as well as from the reft of Alvares's hiftory, all court favourites may draw abundant matter for edification and inftruction: "Sir, it is five-"and forty years fince I was admitted into your fer-"vice. I do not complain of the rewards I have re-"ceived: they were greater than my merits or expec-"tation, as I fhall not deny. There was but one "thing wanting to complete my happinefs; and that "was to have fixed proper limits in time to this great "fortune of mine. While, inftead of choofing retire-"ment, after the example of the greateft men, I ftill "continued in the employment, which I thought not "only my duty, but neceffary for your intereft, I fell "into this misfortune. It is very hard that I fhould "be deprived of liberty, when I have rifked life and "fortune more than once to reftore it to you. Grief "prevents me from faying more. I know that the "Deity is provoked againft me by my fins; but it will "be fufficient for me, if his anger is appeafed by the "calamities I now fuffer. I can no longer bear that "prodigious mafs of riches, which it was wrong in "me to have heaped together. I fhould willingly "refign them, but that every thing I have is in your "power; and I am denied the opportunity of fhowing "mankind, that you have raifed a perfon to the height "of greatnefs, who can contemn wealth as well as pro-"cure it, and give it back to him from whom he re-"ceived it. But I defire you in the ftrongeft terms, "that, as I was obliged by the lownefs of the trea-"fury to raife 10,000 or 12,000 crowns by methods "I ought not to have taken, you will reftore them to "the perfons from whom they were extorted. If you "will not grant this on account of the fervices I have "done, yet I think it neceffary to be done from the "reafon of the thing."

This letter, however, produced no effect in his favour: Alvares was tried, and condemned to lofe his head. After condemnation, he was removed to Valladolid; and, having confeffed himfelf, and received the facrament, he was carried upon a mule to the market-place, in

in the middle of which a large ſcaffold was erected. Mounting the ſcaffold, he paid reverence to the croſs, and preſently gave his hat and ſignet to his page, ſaying, "Theſe are the laſt gifts you will ever receive "from me." He then ſubmitted himſelf to the axe with the utmoſt intrepidity. Dr Geddes relates, that he was executed the 4th of June, others the 5th of July, 1453.

ALUDELS, in chemiſtry, are earthen pots without bottoms, inſerted into each other, and uſed in ſublimations.

ALVEARIUM, in anatomy, the bottom of the *concha*, or hollow of the outer ear.

Alvearium alſo ſignifies a bee-hive. The word is formed of *alveus*, a "channel or cavity;" in alluſion to the *alveoli*, or cells in bee-hives.

Some of the ancients uſe alſo the word *alvearium* for a bee-houſe, more uſually called among us *apiary*.

Alvearium is ſometimes alſo uſed figuratively, to denote a collection. In which ſenſe, *alvearium* amounts to much the ſame with what we otherwiſe call *theſaurus*, *cornucopia*, or the like. Vinc. Boreus has publiſhed an alvearium of law.

ALVEOLUS, in natural hiſtory, the name of the waxen cells in bee hives. Alſo the name of a ſea-foſſil of a conic figure, compoſed of a number of cells, like bee-hives, joined into each other, with a pipe of communication.

Alveolus, in anatomy, the ſockets in the jaws wherein the teeth are fixed.—Some writers ſpeak of teeth growing without alveoli. Pliny mentions a perſon who had a tooth in his palate. Euſtachius relates, that he ſaw a man who at 60 had a tooth growing out of the middle of his fauces. Holler gives an inſtance of a perſon, whoſe teeth were of a piece with his jaws, without any inſertion into alveoli.

ALUM, in chemiſtry, a clear and tranſparent ſaline matter, uſually ſold in large maſſes, of a very auſtere and aſtringent taſte, uſeful in medicine and in various arts.

Moſt of the alum to be met with is artificially prepared by the methods related in their proper place under the article Chemistry, or by others ſimilar to them; though ſometimes a ſmall quantity is produced naturally. This native alum is mixed with heterogeneous matters, or effloreſces in various forms upon the ores during calcination. It rarely occurs in a cryſtallized ſtate, though thus it is ſaid to be met with in Egypt, Sardinia, Spain, Bohemia, and other places. It is alſo found in the waters, impregnated with fixed air, but very ſeldom in fountains or hot medicated waters.

There are ſeveral kinds of alum to be met with; but theſe differ from one another only in being mixed with ſome ſalts which are not of the aluminous kind. That called the Roman alum has been conſidered as preferable to any other. This is uſually met with in ſmall cryſtals, and has a reddiſh colour, moſt probably owing to a ſmall quantity of calx of iron, which, however, does not in the leaſt impair its qualities. The other kinds of alum contain a portion either of vitriolated tartar or ſal ammoniac, according to the nature of the alkali uſed in its preparation. Mr Bergman informs us, that the vegetable alkali, if pure, does not hurt the alum, though it be added in the preparation; but that the volatile alkali, by adulterating it with a portion of vitriolic ſal ammoniac, renders it unfit for ſome purpoſes. The alum, made by adding a portion of clay to the liquor at the beginning of the boiling, he conſiders as equal, if not ſuperior, to Roman alum. He informs us alſo, that a kind of alum ſome time ago began to be manufactured at Brunſwick, which was equal in quality to the Roman alum. On a chemical analyſis of this alum he found it mixed with cobalt.

This ſalt is extremely uſeful in the art of dyeing; as by means of it a great number of colours are fixed and rendered permanent upon cloth, which otherwiſe would either not adhere in any degree, or only for a very ſhort time. In what manner this is accompliſhed we are very much ignorant; the conjectures and theories on this ſubject are related under the article Dyeing. It conſtitutes the baſis of crayons, which generally conſiſt of the earth of alum finely powdered and tinged for the purpoſe. In the preparation of Pruſſian blue, it prevents the baſis of martial vitriol, which is ſoluble in acids, from being precipitated by the ſuperfluous alkali employed in the preparation of that pigment; that is, the alkali which is not ſaturated by the colouring matter. As this baſis adheres more ſtrongly than the clay to the vitriolic acid, and would form a green by the mixture of its yellowneſs, the white earth of alum likewiſe, according to its quantity, dilutes the darker colours, even black itſelf, and produces an infinite number of ſhades. It is alſo of uſe in the making of candles; for being mixed with the tallow, it gives it an hardneſs and conſiſtence which it has not naturally. Wood ſufficiently ſoaked in a ſolution of alum does not eaſily take fire, and the ſame is true of paper impregnated with it; which for that reaſon is very properly employed in preſerving gun-powder, as it alſo excludes the moiſture of the air. Paper impregnated with alum is uſeful in whitening ſilver, and ſilvering braſs without heat. Alum is alſo of uſe in tanning, where it aſſiſts in reſtoring the coheſion of the ſkins almoſt entirely deſtroyed by the lime. Vintners fine down their wines, &c. with alum; fiſhers uſe it to dry codfiſh with; and bakers have mixed it with the flour to make their bread compact and white: to this laſt uſe of it great objections have been made, but unjuſtly, for it is entirely innocent, and now ſeldom uſed.

In medicine it is of conſiderable uſe as an aſtringent and tonic. It is reckoned particularly ſerviceable for reſtraining hemorrhagies, and immoderate ſecretions from the blood; but leſs proper in inteſtinal fluxes. In violent hemorrhagies, it may be given in doſes of 15 or 20 grains, and repeated every hour or half hour till the bleeding abates: in other caſes, ſmaller doſes are more adviſable; large ones being apt to nauſeate the ſtomach, and occaſion violent conſtipations of the bowels. It is uſed alſo externally, in aſtringent and repellent lotions and collyria. Burnt alum taken internally has been highly extolled in caſes of colic. In ſuch inſtances, when taken to the extent of a ſcruple for a doſe, it has been ſaid gently to move the belly, and give very great relief from the ſevere pain. Its officinal preparations are, for internal uſe, *pulvis ſtypticus*, and *aqua ſtyptica* for external applications, the *aqua aluminis*, and *coagulum aluminis* and *alumen uſtum*; which laſt is no other than the alum dried by fire, or freed from the watery moiſture, which, like other ſalts, it always retains in its cryſtalline form. By

this loss of its water it becomes sharper, so as to act as a slight escharotic; and it is chiefly with this intention that it is employed in medicine, being very rarely taken internally. For these preparations, see PHARMACY.

Alum mines are said to have been first found in Italy in the year 1460; and in 1506 king Henry VII. made a monopolizing grant of this commodity to Augustine Chigi, a merchant of Sienna. In the year 1608 the manufacture of alum was first invented, and successively practised in England, meeting with great encouragement in Yorkshire, where it was first made, from Lord Sheffield, and other gentleman of that county. King James I. by advice of his ministry, assumed the monopoly of it to himself, and therefore prohibited the importation of foreign alum; and in 1625 the importation of it was further prohibited by the proclamation of Charles I.

Alum-works, places where alum is prepared, and manufactured in quantities for sale. They differ from alum-mines, as in the former an artificial alum, and in the latter natural alum, is produced.

ALUNTIUM, ALONTIUM, (anc. geog.) a town in the north of Sicily, situated on a steep eminence, at the mouth of the Chydas; said to be as old as the war of Troy. Now in ruins; from which arose the hamlet *St Filadelfo*, in the Val di Demona. The inhabitants were called *Haluntini*.

ALVUS, in anatomy, a term used for the belly in general, but more frequently applied to the bowels.

ALWAIDII, a sect of Mahometans who believe all great crimes to be unpardonable.—The Alwadii stand in opposition to the Morgii. They attribute less efficacy to the true belief in the salvation of men than the rest of the Musselmans.

ALYSSUM, ALLYSON, or ALLYSOIDES, Madwort; (from αλυσσω, *to be mad;* because it was believed to have the property of curing madness): A genus of the siliculosa order, belonging to the tetradynamia class of plants; and, in the natural method, ranking under the 39th order, *Siliquosa*. The characters are: The *calyx* is an oblong four-leav'd perianthium: The *corolla* consists of four cruciform petals; with claws the length of the calyx, the petals shorter: The *stamina* consist of six filaments, the length of the calyx, two of them rather shorter and denticulated; the antheræ are erect and expanding: The *pistillum* has an ovate germen; the stylus is simple, and the length of the stamina; the stigma is obtuse: The *pericarpium* is a sub-globular emarginated silicle, furnished with a bilocular stylus, having an elliptic partition: The *seeds* are few, orbicular, and affixed to filiform receptacles.

Species. Of this genus, Linnæus enumerates 19 species; but none of them are remarkable either for beauty, or any other property, except the halimifolium, or madwort with whole spear-shaped leaves. This spreads itself upon the ground, and never rises to any height. It produces, at the extremity of its branches, very pretty tufts of small white flowers; of which it is seldom destitute for six or seven months successively; for which reason it well deserves a place in the gardens of the curious.

Culture. Though these plants are natives of the southern parts of Europe; yet, if planted on a dry, lean, or rubbishy soil, they will endure our severest winters in the open air.—The halimisolium seldom continues above two or three years, and must therefore be often sown to preserve it; or if the seeds are suffered to fall, the plants will rise without any trouble. It may also be propagated by cuttings, which ought to be planted in April or May, and are very apt to take root, if kept shaded in the heat of the day, and gently refreshed with water.

This plant, as already observed, was thought to cure some kinds of madness; but the present practice has entirely rejected it for this or any other purpose.

ALYTARCHA, a priest of Antioch in Syria, who, in the games instituted in honour of the gods, presided over the officers who carried rods to clear away the crowd and keep order.

In the Olympic games, the alytarches had the same command, and obliged every person to preserve order and decency.

ALZIRA, a town of Spain, in the kingdom of Valencia, seated on the river Xucar, E. Long. 0. 20. N. Lat. 39. 10.

AMA, in ecclesiastical writers, denotes a vessel wherein wine, water, or the like, were held, for the service of the eucharist. In this sense the word is also written amula; sometimes also hama, and hamula.

AMA is sometimes also used for a wine-measure, as a cask, pipe, or the like.

AMABYR, a barbarous custom which formerly prevailed in several parts of England and Wales, being a sum of money paid to the lord when a maid was married within his lordship. The word is old British, and signifies "the price of virginity."

AMADABAT, a corruption from AHMED ABAD, or *Ahmed's city* (so called from a king of that name); a large and populous city of Indostan, and the capital of the province of Guzerat. It is situated in E. Long. 72. 12. N. Lat. 23. 0. Amadabat was formerly called *Guzerat;* and by Shah Jehân nicknamed *Gherd-abâd*, or "the habitation of dust," because it was much incommoded therewith. It was the seat of the Guzerat kings, as it is now of the Mogul governor. The city stands in a beautiful plain; and is watered by the little river Sabremetti, which, though not deep, in time of rains overflows the plains prodigiously. The walls are built with stone and brick, flanked at certain distances with great round towers and battlements. It has twelve gates; and, including the suburbs, is about four miles and an half long. The streets are wide. The *meydân shâh*, or king's square, is 700 paces long and 400 broad, planted round with trees. On the west side is the castle, well walled with free stone, and as spacious as a little city; but its inward appearance is not conformable to its external magnificence. The caravansera is on the south of the square, and its chief ornament. Near the meydan also is the king's palace, whose apartments are richly ornamented: and in the midst of the city is the English factory, where they purchase fine chintz, callicoes, and other Indian merchandize. The place is so full of gardens stored with fruit-trees, that from an eminence it looks like a wood. The Hindoos have here an hospital for sick beasts, and another for sick birds, which they take great care of. According to some late accounts, this city is little inferior to the best in Europe, and is thought to yield ten times as much revenue as Surat.

AMADAN, or HAMADAN, a town of Perſia, between Taurus and Iſpahan, E. Long. 47. 4. N. Lat. 35. 15. It is ſeated at the foot of a mountain, where there are a great many ſprings, which water the adjacent country. The extent of the city is very large; but there are a great many waſte ſpots within it, as well as cultivated land. The houſes are built of brick hardened in the ſun, and have but a very indifferent aſpect. There is but one tolerable ſtreet; and that is where ſtuffs, garments, and the like, are expoſed to ſale: it is ſtraight, long, and wide; and the ſhops are very well furniſhed. The adjacent parts are fruitful in corn and rice, inſomuch that the neighbouring provinces are ſupplied from hence. It is ſaid to enjoy a very ſalubrious air, but the cold in winter is intenſe. The Armenians have a church in this town, but it is a very ill-contrived ſtructure. The Jews have a ſynagogue near a tomb, where they pretend Eſther and Mordecai lie interred. To this place they come in pilgrimage from ſeveral parts of the Levant. About a league from Amadan, there is a mountain called *Nalbana*, which abounds with all ſorts of curious herbs. In the ſpring, people flock to this mountain from all parts to recover their health, by ſucking in the ſalutary effluvia with their breath.

Amadan is a very ancient city. It is ſaid to have been deſtroyed by Nebuchadnezzar, and rebuilt by Darius, who brought hither all his riches. The kings of Perſia frequently retired to this place on account of its delightful ſituation; for which reaſon it obtained the name of the *Royal city*. It was conquered by the khalif Othman, and narrowly eſcaped being deſtroyed by Jenghiz Khan in 1220. It had then ſtrong walls and a good caſtle, which are now in ruins. Its preſent beauty conſiſts in its gardens and ſprings.

AMADANAGER, a town in the hither peninſula of India, in the province of Decan. E. Long. 74. 15. N. Lat. 18. 10.—It was taken by the Moguls in 1598, after a ſiege of ſix months; being at that time defended by a ſtrong caſtle, ſituated on an eminence, and ſurrounded with deep ditches, into which ſeveral ſprings diſcharged their waters.

AMADIA, a trading town of Aſia, in Curdiſtan, belonging to the Turks; ſeated on a high mountain. E. Long. 43. 1. N. Lat. 36. 25.

AMADOW, a kind of black-match, tinder, or touch-wood, which comes from Germany. It is made of a ſort of large muſhroms, or ſpungy excreſcences, which commonly grow on old trees, eſpecially oaks, aſh, and firs. This ſubſtance being boiled in common water, and afterwards dried and well beaten, is then put into a ſtrong lye prepared with ſalt-petre, after which it is again put to dry in an oven. The druggiſts ſell this match wholeſale in France, and ſeveral hawkers retail it. Some give to the amadow the name of *Pyrotechnical Spurge*, becauſe of its aptneſs to take fire.

AMADOWRY, a kind of cotton which comes from Alexandria, by the way of Marſeilles.

AMAIN, in the ſea-language, a term importing to lower ſomething at once. Thus, to *ſtrike amain*, is to lower, or let fall, the top-ſails; to *wave amain*, is to make a ſignal, by waving a drawn ſword, or the like, as a demand that the enemy ſtrike their top-ſails.

AMAK, a ſmall iſland in the Baltic ſea, near Copenhagen, from which it is ſeparated by a canal, over which there is a draw-bridge. Amak is about four miles long and two broad; and is chiefly peopled by the deſcendants of a colony from Eaſt Frieſland, to whom the iſland was conſigned by Chriſtian II. at the requeſt of his wife Elizabeth, ſiſter of Charles V. for the purpoſe of ſupplying her with vegetables, cheeſe, and butter. From the intermarriages of theſe colonies with the Danes, the preſent inhabitants are chiefly deſcended; but as they wear their own dreſs, and enjoy peculiar privileges, they appear a diſtinct race from the natives. The iſland contains about ſix villages, and between 3000 and 4000 ſouls. It has two churches, in which the miniſters preach occaſionally in Dutch and Daniſh. The inhabitants have their own inferior tribunals; but in capital offences are amenable to the king's court of juſtice at Copenhagen. The old national habit, brought by the original colony when they firſt migrated to the iſland, is ſtill in uſe amongſt them. It reſembles the habit of the ancient quakers, as repreſented in the pictures of the Dutch and Flemiſh painters. The men wear broad-brimmed hats, black jackets, full glazed breeches of the ſame colour, looſe at the knee, and tied round the waiſt. The women were dreſſed chiefly in black jackets and petticoats, with a piece of blue glazed cloth bound on their heads. The iſland is laid out in gardens and paſtures; and ſtill, according to the original deſign, ſupplies Copenhagen with milk, butter, and vegetables. E. Long. 12. 10 N. Lat. 55. 20.

AMAL, a town of Sweden, in the province of Daland, ſeated on the river Weſer. It has a good harbour; and carries on a great trade, eſpecially in timber, deals, and tar. E. Long. 12. 40. N. Lat. 58. 50.

AMALEK, the ſon of Eliphaz, by Timna his concubine, and the grandſon of Eſau. Gen. xxxvi. 12. and 1 Chr. i. 36. Amalek ſucceeded Gatam in the government of Edom. He was the father of the Amalekites; a powerful people who dwelt in Arabia Petræa, between the Dead Sea and the Red Sea, or between Havila and Shur (1 Sam. xv. 7.); ſometimes in one canton, and ſometimes in another. It does not appear that they had cities: for there is no mention of any but one in the Scriptures (*id. ib.* 5.); they living generally in hamlets, caves, or tents.

The Iſraelites had ſcarce paſſed the Red Sea on their way to the wilderneſs, before the Amalekites came to attack them in the deſarts of Raphidim (Ex. xvii. 8, &c.); and put thoſe cruelly to the ſword who were obliged, either through fatigue or weakneſs, to remain behind. Moſes, by divine command, directed Joſhua to fall upon this people; to record the act of inhumanity which they had committed in a book, in order to have it always before his eyes; and to revenge it in the moſt remarkable manner. Joſhua therefore fell upon the Amalekites, and defeated them while Moſes was upon the mountain, with Aaron and Hur in company. Moſes, during the time of the engagement, held up his hands, to which the ſucceſs of the battle was owing; for as often as he let them down, Amalek prevailed. But Moſes's hands being tired, Aaron and Hur ſupported his arms, and held them extended, while the battle laſted, which was from morning till the approach of night, when the Amalekites were cut in pieces. This happened in the year of the world 2513, before Chriſt 1491.

Amalek.

The ground of the enmity of the Amalekites againſt the Iſraelites is generally ſuppoſed to have been an innate hatred from the remembrance of Jacob's depriving their progenitor both of his birthright and bleſſing. Their falling upon them, however, and that without any provocation, when they ſaw them reduced to ſo low a condition by the fatigue of their march and the exceſſive drought they laboured under, was an inhuman action, and juſtly deſerved the defeat which Joſhua gave them. Under the Judges (v. 3.), we ſee the Amalekites united with the Midianites and Moabites, in a deſign to oppreſs Iſrael; but Elrud delivered the Iſraelites from Eglon king of the Moabites (Judges iii.), and Gideon (chap. viii.) delivered them from the Midianites and Amalekites. About the year of the world 2930, Saul marched againſt the Amalekites, advanced as far as their capital, and put all the people of the country to the ſword; but ſpared the beſt of all the cattle and moveables, contrary to a divine command; which act of diſobedience was the cauſe of Saul's future misfortunes.

After this war, the Amalekites ſcarce appear any more in hiſtory. However, about the year of the world 2949, a troop of Amalekites came and pillaged Ziklag, which belonged to David (1 Sam. xxx.), where he had left his two wives Ahinoam and Abigail; but he returning from an expedition which he had made in the company of Achiſh into the valley of Jezreel, purſued them, overtook and diſperſed them, and recovered all the booty which they had carried off from Ziklag.

The Arabians maintain Amalek to have been the ſon of Ham and grandſon of Noah; that he was the father of Ad and grandfather of Schedad. Calmet thinks that this opinion is by no means to be rejected; as it is not very probable that Amalek the ſon of Eliphaz, and grandſon of Eſau, ſhould be the father of a people ſo powerful and numerous as the Amalekites were when the Iſraelites departed out of Egypt. Moſes in the book of Geneſis (xiv. 7.) relates, that in Abraham's time, long before the birth of Amalek the ſon of Eliphaz, the five confederate kings carried the war into Amalek's country, about Kadeſh; and into that of the Amorites, about Hazezontamar. The ſame Moſes (Numb. xxiv. 20.) relates, that the diviner Balaam, obſerving at a diſtance the land of Amalek, ſaid, in his prophetic ſtyle, "Amalek is the firſt, the head, the original of the nations; but his latter end ſhall be that he periſh for ever." Our commentator obſerves, that this epithet of the firſt of nations cannot certainly agree with the Amalekites deſcended from the ſon of Eliphaz, becauſe the generation then living was but the third from Amalek. Beſides, Moſes never reproaches the Amalekites with attacking their brethren the Iſraelites; an aggravating circumſtance which he would not have omitted were the Amalekites deſcended from Eſau; in which caſe they had been the brethren of the Iſraelites. Laſtly, We ſee the Amalekites almoſt always joined in the Scripture with the Canaanites and Philiſtines, and never with the Edomites; and when Saul made war upon the Amalekites, and almoſt utterly deſtroyed them, we do not find that the Edomites made the leaſt motion towards their aſſiſtance, nor to revenge them afterwards. Thence it is thought probable, that the Amalekites who are ſo often mentioned in Scripture were a free people deſcended from Canaan, and devoted to the curſe as well as the other Amorites, and very different from the deſcendants of Amalek the grandſon of Eſau.

Amalek, Amalfi.

The accounts which the Arabians give us of the Amalekites deſtroyed by Saul are as follow. Amalek was the father of an ancient tribe in Arabia, exterminated in the reign of Saul. This tribe contained only the Arabians who are called *Pure;* the remains whereof were mingled with the poſterity of Joktan and Adnan, and ſo became Moſarabes or Moſtaarabes; that is to ſay, Arabians blended with foreign nations. They farther believe, that Goliah, who was overcome by David, was king of the Amalekites; and that the giants who inhabited Paleſtine in Joſhua's time were of the ſame race. That at laſt part of the Amalekites retired into Afric while Joſhua was yet living, and ſettled upon the coaſts of Barbary, along the Mediterranean ſea. The ſon of Amalek was Ad, a celebrated prince among the Arabians. Some make him the ſon of Uz, and grandſon of Aram the ſon of Shem. Let this be as it will, the Mahometans ſay that Ad was the father of an Arabian tribe called *Adites;* who were exterminated, as they tell us, for not hearkening to the patriarch Eber, who preached the unity of God to them. Ad had two ſons, Schedad and Schedid.

AMALFI, an ancient city of Italy, ſituated in E. Long. 15. 20. N. Lat. 40. 35.—It is ſaid to have derived its origin from a number of Roman families, who, about the middle of the fourth century, either from private views of emolument, or in conſequence of compulſory orders from the emperor, had left Rome and embarked for Conſtantinople; but meeting with ſtorms on their paſſage, were caſt away on the ſhores of Salerno, and deprived of the means of purſuing their voyage. In this ſtate of perplexity they long remained, but at laſt came to the reſolution of ſettling on the preſent ſite of Amalfi, where they expected to enjoy ſecurity and ſufficient plenty of the neceſſaries of life. The earlieſt notice of them in this ſettlement dates no higher than the latter end of the ſixth century. Impervious mountains and inacceſſible coaſts preſerved their infant ſtate from the firſt fury of the Lombards, who ſeldom attempted the conqueſt of a maritime people.

In the year 825, when this little republic had, under the patronage of the eaſtern emperors, attained a degree of wealth and reputation ſufficient to excite the ambition of its neighbours, Sico, prince of Salerno, marched a body of troops by night; ſurpriſed Amalfi; and, carrying off the greateſt part of the inhabitants, compelled them to fix at Salerno, which had lately ſuffered a great loſs of people by an epidemical diſorder. But before the fourth year of their captivity was expired, the Amalfitans took advantage of the abſence of the Salernitan chiefs, who were than carrying on a war with the Beneventans; armed themſelves; and, after burning and plundering Salerno, marched in triumph back to their own country.

Here they framed a better ſyſtem of government, and reformed many abuſes in their former legiſlation; adopting various meaſures that were likely to promote internal concord and defeat the evil intentions of foreign enemies. Their firſt plan was to veſt the ſupreme authority in a temporary prefect; but the experience of

of a few years caufed them to prefer lodging that power in the hands of a duke elected for the term of his natural life. Under thefe governors Amalfi attained the fummit of her military and commercial glory. It extended its territory, which reached eaftward from Vico Vecchio, and weftward to the promontory of Minerva, including likewife the ifland of Caprea, and the two iflands of the Galli. Towards the north it comprehended the cities of Lettere, Gragnans, Pimontio, and Capule di Franchi; towards the fouth, thofe of Scala, Ravelli, Minori, Majuri, Atrani, Tramonti, Agerula, Citara, Prajano, and Rofilano.

Leo IV. found the Amalfitans an ufeful ally in his wars with the infidels, and honoured the commonwealth with the title of *Defender of the Faith*. The Neapolitans, with whom, as Greek vaffals, they were united in ftrict bonds of friendfhip, experienced many fignal favours at their hands; and the Muffulmen themfelves found it expedient to court their alliance, and to enter into treaty with them. Their fituation had from the beginning given them a turn to commerce, and their attention to naval affairs fo much confequence in the eyes of their protector, the emperor of Conftantinople, that by his orders a court was eftablifhed at Amalfi for the decifion of all controverfies arifing in maritime tranfactions. Its code and reports became the general rule in thofe cafes throughout this part of Europe; its precedents and decrees were allowed to be good authority to found judgment upon even in foreign tribunals.—To crown the mercantile and naval glory of the republic, it was referved to the lot of an Amalfitan to make, or at leaft to perfect, the moft important difcovery ever made for the improvement of navigation. Pafitano, a village which ftands on the fhore a few miles weft of Amalfi, boafts of having given birth to Flavius Gioia, the inventor of the mariner's compafs.

The merchants of this town engroffed the trade of the Levant, and tranfacted the commercial bufinefs of the world in a lucrative and exclufive manner. The Pifans, Venetians, and Genoefe, rofe upon their ruin; and after monopolizing the emoluments of trade for fome ages, made way for the more comprehenfive and daring fpirit of the prefent maritime powers.

At prefent Amalfi is fubject to Naples, and is the fee of an archbifhop. It is but a fhadow of what it was in its flourifhing ftate, when it extended over the ftupendous rocks that hang on each fide, ftill crowned with battlemented walls and ruined towers. Its buildings, Mr Swinburne fays, are not remarkable for elegance or fize; and contain at moft 4000 inhabitants, who feem to be in a poor line of life. The cathedral is an uncouth building. Under the choir is the chapel and tomb of the apoftle St Andrew; in whofe honour the edifice was dedicated, when Cardinal Capuano in 1208 brought his body from Conftantinople.

AMALGAM, mercury united with fome metal.

AMALGAMATION, the operation of making an amalgam, or mixing mercury with any metal.

For the combination of one metal with another, it is generally fufficient that one of them be in a ftate of fluidity. Mercury being always fluid, is therefore capable of amalgamation with other metals without heat; neverthelefs, heat confiderably facilitates the operation.

To amalgamate without heat requires nothing more than rubbing the two metals together in a mortar; but the metal to be united with the mercury fhould be previoufly divided into very thin plates or grains. When heat is ufed (which is always moft effectual, and with fome metals indifpenfably neceffary), the mercury fhould be heated till it begins to fmoke, and the grains of metal made red-hot before they are thrown into it. If it be gold or filver, it is fufficient to ftir the fluid with an iron rod for a little while, and then throw it into a veffel filled with water. This amalgam is ufed for gilding or filvering on copper, which is afterwards expofed to a degree of heat fufficient to evaporate the mercury.

Amalgamation with lead or tin is effected by pouring an equal weight of mercury into either of thefe metals in a ftate of fufion, and ftirring with an iron rod. Copper amalgamates with great difficulty, and iron not at all.

AMALTHÆA, the name of the Cumæan Sibyl, who offered to Tarquinius Superbus nine books, containing the Roman deftinies, and demanded 300 pieces of gold for them. He derided her; whereupon fhe threw three of them into the fire; and returning, afked the fame price for the other fix; which being denied, fhe burnt three more; and returned, ftill demanding the fame price. Upon which Tarquin confulting the pontiffs, was advifed to buy them. Thefe books were in fuch efteem, that two magiftrates were created to confult them upon extraordinary occafions.

AMALTHEA, in pagan mythology, the daughter of Meliffus, king of Crete, and the nurfe of Jupiter, whom fhe fed with goat's milk and honey. According to others, Amalthea was a goat, which Jupiter tranflated into the fky, with her two kids, and gave one of her horns to the daughters of Meliffus, as a reward for the pains they had taken in attending him. This horn had the peculiar property of furnifhing them with whatever they wifhed for; and was thence called the *cornucopia*, or horn of plenty.

AMALTHÆUS (Jerome, John Baptifta, and Cornielle), three celebrated Latin poets of Italy, who flourifhed in the 16th century. Their compofitions were printed at Amfterdam in 1685. One of the pretticft pieces in that collection is an epigram on two children, whofe beauty was very extraordinary, though each of them was deprived of an eye:

'Lumine Acon dextro, capta eft Leonilla finiftro:
'Et poterat forma vincere uterque deos.
'Parve puer, lumen quod habes concede forori;
'Sic tu cæcus Amor, fic erit illa Venus.'

AMAMA (Sixtinus), profeffor of the Hebrew tongue in the univerfity of Franeker, a man of great learning, was born in Friefland, and had ftudied under Drufius. He publifhed a criticifm upon the tranflation of the Pentateuch; collated the Dutch tranflation of the Bible with the original and the moft accurate tranflations; and wrote a cenfure of the Vulgate tranflation of the hiftorical books of the Old Teftament, Job, the Pfalms, and Canticles. It is impoffible to anfwer the reafons whereby he fhows the neceffity of confulting the originals.

nals. This he recommended fo earneftly, that fome fynods, being influenced by his reafons, decreed, that none fhould be admitted into the miniftry but fuch as had a competent knowledge of the Hebrew and Greek text of the Scripture. He died in 1629.

AMANCE, a town in the duchy of Lorrain, upon a rivulet of the fame name. E. Long. 6. 10. N. Lat. 48. 45.

AMAND (Mark-Anthony-Gerard, fieur de St.), a French poet, was born at Roan in Normandy in 1594. In the epiftle dedicatory to the third part of his works, he tells us, that his father commanded a fquadron of fhips in the fervice of Elizabeth queen of England for 22 years, and that he was for three years prifoner in the Black Tower at Conftantinople. He mentions alfo, that two brothers of his had been killed in an engagement againft the Turks. His own life was fpent in a continual fucceffion of travels, which was of no advantage to his fortune. There are mifcellaneous poems of this author, the greateft part of which are of the comic or burlefque, and the amorous kind. Though there are many blemifhes in his poems, yet he had the talent of reading them in fo agreeable a manner, that every one was charmed with them. In 1650, he publifhed "Stances fur la groffeffe de la reine de Pologne et de Suede." There are fix ftanzas of nine verfes each. In 1653, he printed his "Moife fauve, idyle heroique." This poem had at firft many admirers: Monf. Chapelain called it a *fpeaking picture;* but it has fince fallen into contempt. Amand wrote alfo a very devout piece, intitled "Stances à M. Corneille, fur fon imitation de Jefus Chrift," which was printed at Paris in 1656. Mr Broffette fays that he wrote alfo a poem upon the moon, wherein he paid a compliment to Lewis XIV. upon his fkill in fwimming, in which he ufed often to exercife himfelf when he was young, in the river Seine; but the king could not bear this poem to be read to him, which is faid to have affected the author to fuch a degree, that he did not furvive it long. He died in 1661, being 67 years of age. He was admitted a member of the French academy, when it was firft founded by cardinal Richlieu, in the year 1633, and Mr Peliffon informs us, that, in 1637, at his own defire, he was excufed from the obligation of making a fpeech in his turn, on condition that he would compile the comic part of the dictionary which the academy had undertaken, and collect the burlefque terms. This was a tafk well fuited to him; for it appears by his writings that he was extremely converfant in thefe terms, of which he feems to have made a complete collection from the markets and other places where the lower people refort.

AMAND (St.), a city of France, in Bourbonois, on the confines of Berry, feated upon the river Cher. It was built in 1410 on the ruins of Orval. E. Long. 3. 30. N. Lat. 46. 32.

AMAND (St.), a city of the Low Countries, in the earldom of Flanders, feated upon the river Scarpe. It contains about 600 houfes, and 3000 or 4000 inhabitants. The abbot of the place is the temporal lord, and difpofes of the magiftracy. It was given to France by the treaty of Utrecht. E. Long. 2. 35. N. Lat. 50. 27.

AMANICÆ PYLÆ, (Ptolemy); AMANIDES PYLÆ, (Strabo); AMANI PORTÆ, (Pliny): ftraits or defiles in mount Amanus, through which Darius entered Cilicia; at a greater diftance from the fea than the Pylæ Ciliciæ or Syriæ, through which Alexander paffed.

AMANTEA, a fea-port town and bifhop's fee of the kingdom of Naples, fituated near the bay of Euphemia in the province of Calabria, in E. Long. 16. 20. N. Lat. 39. 15.

AMANUS, a mountain of Syria, feparating it from Cilicia; a branch of mount Taurus, (Cicero, Strabo, Pliny); extending chiefly eaftward, from the fea of Cilicia, to the Euphrates: now called *Monte Negro*, or rather *Montagna Neres*, by the inhabitants; that is, the watery mountain, as abounding in fprings and rivulets.

AMAPALLA, a city and port-town of North America, in the province of Guatimala, feated on the gulph of the fame name, in the Pacific ocean. W. Long. 63. 20. N. Lat. 12. 30.

AMARANTE, an order of knighthood, inftituted in Sweden by queen Chriftina, in 1653, at the clofe of an annual feaft, celebrated in that country, called *Wirtfchaft*. This feaft was folemnized with entertainments, balls, mafquerades, and the like diverfions, and continued from evening till the next morning.—That princefs, thinking the name too vulgar, changed it into that of the *feaft of the gods*, in regard each perfon here reprefented fome deity as it fell to his lot. The queen affumed the name of *Amarante;* that is, unfading, or immortal. The young nobility, dreffed in the habit of nymphs and fhepherds, ferved the gods at the table.—At the end of the feaft, the queen threw off her habit, which was covered with diamonds, leaving it to be pulled in pieces by the mafques; and, in memory of fo gallant a feaft, founded a military order, called in Swedifh *Cefchilfchafft*, into which all that had been prefent at the feaft were admitted, including 16 lords and as many ladies, befides the queen. Their device was the cypher of *Amarante*, compofed of two A's, the one erect, the other inverted, and interwoven together; the whole inclofed by a laurel crown, with this motto, *Dolce nella memoria*.

Bulftrode Whitlock, the Englifh ambaffador from Cromwell to the court of Sweden, was made a knight of the order of *Amarante:* on which account it feems to be, that we fometimes find him ftyled *Sir Bulftrode Whitlock*.

AMARANTHOIDES, in botany, the trivial name of a fpecies of illecebrum. See ILLECEBRUM.

AMARANTHUS (of α privative, and μαραινω, *to wither*, becaufe the flower of this plant when cropped does not foon wither), AMARANTH, or FLOWER-GENTLE: A genus of the pentandria order, belonging to the monœcia clafs of plants; and, in the natural method, ranking under the 54th order, *Mifcellaneæ*. The characters are: The *male calyx* is a five or three leav'd perianthium, erect, coloured, and perfiftent: There is no *corolla:* The *ftamina* confift of five or three erect capillary filaments, the length of the calyx; the antheræ are oblong and verfatile: The *female* calyx the fame as the male, and no corolla: The *piftillum* has an ovate germen; the ftyli are three, fhort, and fubulated; the ftigmata fimple and perfiftent: The *pericarpium* is

 an

Amaranthus, Amaryllis.

an ovate capsule, three-beaked, unilocular, and cut round: The *feed* is one, globular, compreffed, and large.

Species. Of this genus Linnæus enumerates 19 fpecies; the moft remarkable of which are the following. 1. The tricolor, or three-coloured amaranthus. This has been long cultivated in gardens, on account of the beauty of its variegated leaves, which are of three colours, green, yellow, and red; and very elegantly mixed. When the plants are in full vigour, the leaves are large, and clofely fet from the bottom to the top of the ftalks, and the branches form a fort of pyramid; fo that there is not a more beautiful plant than this when it is in full luftre. 2. The melancholicus, bicolor, or two-coloured amaranthus. This greatly refembles the former in its manner of growth; but the leaves have only two colours, which are an obfcure purple, and a bright crimfon. Thefe are fo blended as to fet off each other, and, when the plants are vigorous, make a fine appearance. 3. The caudata, with very long hanging cylindrical fpikes. This fpecies is a native of America. It hath an upright ftem three feet high; the leaves and ftalks are of a pale green colour. The fpikes of flowers are produced from the wings of the ftalks, and alfo at the extremities of the branches. They are of a bright purple colour, and hang downward, fometimes to the length of two feet and an half, fo that many of them touch the ground. 4. The maximus, or tree-like amaranthus, grows with a ftrong ftem, to the height of feven or eight feet. Towards the top it fends forth many horizontal branches, garnifhed with oblong rough green leaves. At the extremity of every fhoot, the cylindrical fpikes of flowers are produced. They are of a purple colour, and hang downward like the laft; but are feldom half the length, tho' much thicker than the former. 5. The fanguineus, with compound fpikes, and oblong oval leaves. This is a native of the Bahama iflands. It is an efculent plant, and bears fine flowers. It grows to the height of three feet, with purple ftalks and leaves. The fpikes are fhort and cylindrical, of a bright purple at firft, but afterwards fade to a darker colour. They are frequently produced from the wings of the ftalks; but at the extremity of the ftalk arifes a large clufter of fpikes, which are placed crofs-wife, with one upright ftalk in the middle. 6. The oleraceus, with obtufe indented leaves. This has no beauty; but it is ufed by the Indians as a fubftitute to cabbage.

Culture. The two firft of thefe fpecies being tender, require fome art and care to bring them to perfection in Britain, by a fucceffion of hot-bed, with proper waterings, airings, and fhadings.

Where people are curious in having thefe annual plants in great perfection, there fhould be a glafs-cafe erected, with upright and floping glaffes on every fide, with a pit in the bottom for tan, in which the pots fhould be plunged. If this is raifed eight or nine feet to the ridge, and the upright glaffes are five feet, there will be room enough to raife thefe and other annual plants to great perfection; and in fuch a building, many tender vegetables, which rarely perfect their feeds in this climate, may be every year brought forward fo as to ripen their feeds.

AMARYLLIS, LILY-ASPHODEL: A genus of the monogynia order, belonging to the hexandria clafs of plants; and, in the natural method, ranking under the 9th order, *Spathaceæ*. The characters are: The *calyx* is an oblong obtufe fpatha, emarginated, and withering: The *corolla* confifts of fix petals, lanced: The *ftamina* confift of fix fubulated filaments; the antheræ oblong, incumbent, and afcending: The *piftillum* has a roundifh fulcated germen beneath; a filiform ftylus, nearly the length of the ftamina; the ftigma trifid and flender: The *pericarpium* is an ovate trilocular capfule, with three valves: The *feeds* are many.

Amaryllis.

Principal Species. 1. The lutea, or autumnal narciffus. This is ufually fold by gardeners, along with colchicums, for autumnal ornaments to gardens. For this purpofe it is very proper, as it will keep flowering from the beginning of September to the middle of November, provided the froft is not fo fevere as to deftroy the flowers. Although there is but one flower in each cover, yet there is a fucceffion of flowers from the fame root, efpecially when they are fuffered to remain three or four years unremoved. The flowers feldom rife above three or four inches high. They are fhaped fomewhat like the flowers of the yellow crocus; the green leaves come up at the fame time, like the faffron; and, after the flowers are paft, the leaves increafe all the winter. The roots are bulbous, and fhaped like thofe of the narciffus; fo are proper ornaments for fuch borders as are planted with cyclamens, faffron, autumnal crocus, colchicums, and fuch low autumnal flowers. 2. The formofiffima, or jacobæa lily, produces its flowers two or three times in a year, without being regular to any feafon. The flowers are of a deep red, the under petals very large, and the whole flower ftands nodding on one fide of the ftalk, making a beautiful appearance. The ftems of thefe flowers are produced from the fides of the bulbs; fo that when the flowers produced on one fide are decayed, another ftalk arifes from the other fide of the bulb; but there is no more than one flower produced on the fame ftalk. When the roots are in vigour, flowers will be produced from March to the beginning of September. 3. The farnienfis, or Guernfey lily, is fuppofed to have come originally from Japan, but has been many years cultivated in the gardens of Guernfey and Jerfey; in both which places they feem to thrive as well as if it was their native country, and from thefe iflands their roots are fent annually to the curious in moft parts of Europe. The flowers of this fpecies are admired for the richnefs of their colour, which is commonly red, though they have no fcent. They appear towards the end of September; and, if properly managed, will continue a month in beauty. The roots of thefe plants do not flower again the fucceeding year, as is the cafe with many other bulbs: but if their bulbs contain two buds in their centre, which is often the cafe, they frequently flower twice in three years; after which the fame individual root does not flower again in feveral years, but only the offsets from it. 4. The regina, or belladonna lily, is a native of Portugal, where it was formerly cultivated in great plenty; but of late it has been fupplanted by the jacobæa lily, fo that the roots which have been brought from that country for fome time paft for the belladonna, have generally proved the jacobæa lily. This kind, if properly managed, will fometimes put out two or three ftems, growing near

three feet high, and produce many flowers in each umbel, which make a fine appearance during the month of October. 5. The zeylanica, or Ceylon lily, is a native of the West Indies, and usually flowers in June. Sometimes the same root will flower again in autumn, but the flowers are of no long duration. 6. The orientalis, or lily daffodil, with leaves shaped like a tongue. This is a native of the Cape of Good Hope. The bulbs of the root are large and almost round; the leaves long, broad, and rounded at their extremities; these spread two ways on the surface of the ground, and do not come up till after the flower-stem appears, which is generally in November. After the flowers are past, the leaves increase till spring, and in May they begin to decay; so that from the middle of June to October the roots are entirely destitute of leaves.

Culture. The first sort is very hardy, and will thrive in almost any soil or situation; but will succeed best in a fresh light dry soil, and not too near the dripping of trees, or too near walls. It increases very fast by offsets, by which all the other species are also to be propagated. These roots may be transplanted any time from May to the end of July; after which it will be too late to remove them.—The jacobæa ought to be kept in a moderate stove all winter; in which case it will send forth plenty of offsets, that will produce vigorous plants.—The roots of the Guernsey lily are generally brought over in June and July; but the sooner they are taken out of the ground after the leaves decay, the better: for altho' the roots which are taken up when their flower-stems begin to appear, will flower; yet their flowers will not be so large, nor will their roots be near so good after, as those which were removed before they sent forth fresh fibres. When these roots come over, they should be planted in pots filled with fresh, light, sandy earth, mixed with a little very rotten dung, and placed in a warm situation, observing now and then to refresh the earth with water: but by no means let them have too much wet, which would rot their roots, especially before they come up. About the middle of September, such of the roots as are strong enough to flower will begin to show the bud of their flower-stem: therefore these pots ought to be removed into a situation where they may have the benefit of the sun, and be sheltered from strong winds. When the flowers begin to open, the pots should be removed under shelter, to prevent injury from too much wet.—After the flowers are decayed, the green leaves will begin to shoot forth in length; and, if sheltered from severe cold, will continue growing all winter: but they must have as much free air as possible in mild weather, and are to be covered only in great rains or frosts. For this purpose, a common hot-bed frame is the most proper shelter for them; the glasses of which may be taken off every day in dry open weather, which will encourage the leaves to grow strong and broad. The roots should be transplanted every fourth or fifth year, toward the end of June or beginning of July; the offsets also should be taken off and planted in pots, where in three years time they will produce flowers. The other species of the amaryllis may easily be raised by taking care to shelter them in a stove from the winter's cold.

AMARYNTHUS (anc. geog.), a hamlet of Eretrias, in the island of Eubœa, about seven stadia distant from its walls. Here Diana was worshipped by an annual solemnity, at which those of Carystus assisted; hence the title of the goddess was *Amarynthis*, and *Amarysia*.

AMASIA (anc. geog.), now *Marpurg*, a city in the landgraviate of Hesse, on the Lahn. According to others, it is Embden in Westphalia.

Amasia, an ancient town of Turkey, in Natolia, remarkable for the birth of Strabo the geographer. It is the residence of a bashaw, and gives its name to the province it stands in, where there are the best wines and the best fruits in Natolia. It is seated near the river Iris or Casalmack; and was anciently the residence of the kings of Cappadocia. E. Long. 36. 10. N. Lat. 39. 33.

Amasia, the name of the northern division of Lesser Asia, lying on the south shore of the Euxine sea in Natolia. It takes its name from Amasia the capital, mentioned in the preceding article.

AMASONIA, in botany: A genus of the angiospermia order, belonging to the didynamia class of plants; the characters of which are: The *calyx* is a tripartite monophyllous perianthium, bell-shaped and persistent: The *corolla* is monopetalous and tubular; the border quinquefid, expanding, and small: The *stamina* consist of four filaments longer than the corolla; the antheræ oval and incumbent: The *pistillum* has an ovate germen; the stylus the length of the stamina; the stigmata two, acute: There is no *pericarpium*: The *seed* is an ovate unilocular nut, the length of the calyx.

AMATHUS, a very ancient town in the south of Cyprus (Strabo, Ptolemy): so called from Amathus the founder; or, according to others, from Amath, a Phœnician town sacred to Venus, with a very ancient temple of Adonis and Venus: and hence Venus is denominated *Amathusia* (Tacitus). According to Ovid, it was a place rich in copper-ore, and where the inhabitants became *Cerastæ*, or horned. Now called *Limisso*.

Amathus (anc. geog.), a town of the tribe of Gad, beyond Jordan; but whether at a greater or less distance from it, is not so easy to determine. Eusebius places it in the Lower Peræa; Reland, in Ramoth-Gilead. Gabinius, proconsul of Syria, established five juridical conventions in Judea; two of which were on the other side Jordan; one at Gadara, the other at Amathus (Josephus).

AMATORII musculi, in anatomy, a term sometimes used for the obliquus superior and obliquus inferior muscles of the eye, as these muscles assist in ogling or drawing the eye sideways.

AMATRICE, a city of the kingdom of Naples, in the farther Abruzzo, upon the confines of the pope's territories, and the marquisate of Ancona.

AMAUROSIS, in medicine, a deprivation of sight, the eye remaining fair and seemingly unaffected. A perfect amaurosis is when the blindness is total; when there is still a power of distinguishing light from darkness, the disease is called by M. de St Ives an *imperfect amaurosis*. There is a periodical sort which comes on instantaneously, continues for hours, or days, and then disappears. Mr Hey, surgeon at Leeds, mentions several cases of patients afflicted with the amaurosis who were relieved by being electrified.

AMAZONIA, or the country of the American

Amazons, is ſituate between 50 and 70 degrees of weſt longitude; and between the equator and 15 degrees of ſouth latitude; being bounded on the ſouth by La Plata, on the weſt by Peru, on the north by the province of Terra Firma, and on the eaſt by Brazil.

With reſpect to the Amazons ſaid to have given name to this territory, they have been repreſented as governed and led to war only by their queen. No men were ſuffered to live among them; though thoſe of ſome neighbouring nations were ſuffered to viſit them, at a certain ſeaſon, for the ſake of procreation. The females iſſuing from this commerce were bred up with care, and inſtructed in what relates to war and government; as to the males, they were ſent away into the country of their fathers. But no ſuch nation is at preſent to be found, any more than the giants and canibals mentioned by the firſt adventurers thither.

Amazonia is generally a flat region, abounding in woods, lakes, rivers, bogs, and moraſſes. The chief river, and one of the largeſt in the world, is that called the river of Amazons, or the Orellana, which is formed by two large rivers, the one riſing in the province of Quito, a little ſouth of the equator, in 73 degrees of weſt longitude, and the other, named Xauxa, riſing in the lake of Bourbon, near the Andes, in ten degrees of ſouth latitude. Thoſe two rivers uniting on the confines of Peru and Amazonia, in three degrees odd minutes of ſouth latitude, aſſume the name of Amazon; whence running eaſtward upwards of 200 miles, and afterwards inclining to the north, they fall into the Atlantic ocean by 84 channels, which in the rainy ſeaſon overflow the adjacent country. Beſides the two ſtreams mentioned, a multitude of others, both on the north and ſouth ſide, contribute to the formation of this extraordinary river. As it runs almoſt acroſs the broadeſt part of South America, it is computed to be between four and five thouſand miles in length, including all its windings. Its channel from Junta de los Reyos, about 60 degrees from its head, to the river Maranhon, is from one to two leagues broad; it then widens from three to four, and becomes gradually broader as it approaches the ocean. Between the places laſt mentioned, its depth is from five to ten fathom; but from Maranhon to Rio Negro it increaſes to 20 fathom; after which it is ſometimes 30, and ſometimes 50 fathoms, or more, till it comes near the end of its courſe. It has no ſand-banks, nor does the ſhore ſhelve ſo as to render it dangerous for veſſels. The manetu and tortoiſe abound both upon the banks of this and the other rivers; and the fiſhermen muſt be upon their guard againſt the crocodiles, alligators, and water-ſerpents, which alſo ſwarm here.

The air, as in the countries under the ſame parallel, is obſerved to be nearly as cool under the equator as about the tropics, on account of the rains continuing longer, and the ſky in that ſeaſon being clouded. Beſides, an eaſterly wind ſets from the Atlantic up the river ſo ſtrong, that veſſels are carried by it againſt the ſtream.

The produce of the country is Indian corn and the caſſavi root, of which they make flour and bread; tobacco, cotton, ſugar, ſarſaparilla, yams, potatoes, and other roots. They have alſo plenty of veniſon, fiſh, and fowl. Among the latter are vaſt flocks of parrots of all colours, the fleſh of which ſerves for food and the feathers for ornament. All the trees here are evergreens; and fruits, flowers, and herbage, are in perfection all the year round. The principal fruits are cocoa-nuts, ananas or pine-apples, guavas, bananas, and ſuch others as are uſually found between the tropics. The foreſt and timber trees are cedar, Brazil wood, oak, ebony, logwood, iron-wood, ſo called from its weight and hardneſs, and ſeveral ſorts of dyeing wood.

The natives are of the common ſtature, with good features, a copper complexion, black eyes and hair. It is computed that there are of them about 150 different tribes or nations, and the villages are ſo numerous as to be within call of one another. Among thoſe the Homagues, a people near the head of the river, are famous for their cotton manufactures; the Jurines, who live between five and ten degrees of latitude, for their joiners works; and the Wroſiſſares for their earthen ware. The Topinambes, who inhabit a large iſland in the river, are remarkable for their ſtrength. Some of thoſe nations frequently make war upon each other. Their armour conſiſts of darts, javelins, bows and arrows, and they wear targets of cane, or fiſh-ſkin. They make ſlaves of their priſoners, whom they otherwiſe uſe very well. Every tribe is governed by its reſpective chief or king, the marks of whoſe dignity are a crown of parrots feathers, a chain of lions teeth or claws hung round his neck, or girt about his waiſt, and a wooden ſword, which he carries in his hand.

Moſt of thoſe nations, except the Homagues, go naked. The men thruſt pieces of cane through their ears and under-lips, as well as through the ſkin of the pudenda. At the griſtle of their noſes they alſo hang glaſs beads, which wag to and fro when they ſpeak. They are ſuch ſkilful markſmen, that they will ſhoot fiſh as they ſwim; and what they catch they eat without either bread or ſalt. They worſhip images, which they always carry with them on their expeditions; but they neither have temples nor any order of prieſts; and permit both polygamy and concubinage.

The country affords neither gold nor ſilver mines; only a ſmall quantity of the former is found in the rivulets which fall into the Amazon near its ſources in Peru. While the Spaniards imagined that it contained thoſe metals, they made great efforts from Peru to reduce this territory to ſubjection; till being at length undeceived, they abandoned the deſign.

AMAZONS, in antiquity, a nation of female warriors, who founded an empire in Aſia Minor, upon the river Thermodoon, along the coaſts of the Black Sea. They are ſaid to have formed a ſtate out of which men were excluded. What commerce they had with that ſex, was only with ſtrangers; they killed all their male children; and they cut off the right breaſts of their females, to make them more fit for the combat. From which laſt circumſtance it is, that they are ſuppoſed to take their name, viz. from the privative α, and μαζος, *mamma*, "breaſt." But Dr Bryant, in his Analyſis of Ancient Mythology, explodes this account as fabulous; and obſerves, that they were in general Cuthite colonies from Egypt and Syria, who formed ſettlements in different countries, and that they derived their name from *zon*, the "ſun," which was the national object of worſhip. Vol. iii. p. 463.—It has indeed

Amazons. deed been controverted even among ancient writers, whether ever there really were ſuch a nation as that of the Amazons. Strabo, Palæphatus, and others, deny it. On the contrary, Herodotus, Pauſanius, Diodorus Siculus, Trogus Pompeius, Juſtin, Pliny, Mela, Plutarch, &c. expreſsly aſſert it.

M. Petit, a French phyſician, publiſhed a Latin diſſertation in 1685, to prove that there was really a nation of Amazons; it contains abundance of curious inquiries, relating to their habit, their arms, the cities built by them, &c. Others of the moderns alſo maintain, that there exiſtence is ſufficiently proved by the teſtimony of ſuch of the hiſtorians of antiquity as are moſt worthy of credit; by the monuments which many of them have mentioned; and by medals, ſome of which are ſtill remaining; and that there is not the leaſt room to believe that what is ſaid of them is fabulous.

The Amazons are mentioned by the moſt ancient of the Greek writers. In the third book of the Iliad, Homer repreſents Priam ſpeaking of himſelf as having been preſent, in the earlier part of his life, in a battle with the Amazons: and ſome of them afterwards came to the aſſiſtance of that prince during the ſiege of Troy.

The Amazons are particularly mentioned by Herodotus. That hiſtorian informs us, that the Grecians fought a battle with the Amazons on the river Thermodoon, and defeated them. After their victory, they carried off all the Amazons they could take alive, in three ſhips. But whilſt they were out at ſea, theſe Amazons conſpired againſt the men, and killed them all. Having, however, no knowledge of navigation, nor any ſkill in the uſe of the rudder, ſails, or oars, they were driven by wind and tide till they arrived at the precipices of the lake Mæotis, in the territories of the Scythians, Here the Amazons went aſhore, and marching into the country, ſeized and mounted the firſt horſes they met with, and began to plunder the inhabitants. The Scythians at firſt conceived them to be men; but after they had had ſkirmiſhes with them, and taken ſome priſoners, they diſcovered them to be women. They were then unwilling to carry on hoſtilities againſt them; and by degrees a number of the young Scythians formed connections with them, and were deſirous that theſe gentle dames ſhould live with them as wives, and be incorporated with the reſt of the Scythians. The Amazons agreed to continue their connection with the Scythian huſbands, but refuſed to aſſociate with the reſt of the inhabitants of the country, and eſpecially with the women of it. They afterwards prevailed upon their huſbands to retire to Sarmatia, where they ſettled. "Hence," ſays Herodotus, "the wives of the Sarmatians ſtill continue their ancient way of living. They hunt on horſeback in the company of their huſbands, and ſometimes alone. They march with their armies, and wear the ſame dreſs with the men. The Sarmatians uſe the Scythian language, but corrupted from the beginning, becauſe the Amazons never learned to ſpeak correctly. Their marriages are attended with this circumſtance: no virgin is permitted to marry till ſhe has killed an enemy in the field; ſo that ſome always grow old before they can qualify themſelves as the law requires."

Diodorus Siculus ſays, "There was formerly a nation, who dwelt near the river Thermodoon, which was ſubjected to the government of women, and in which the women, like men, managed all the military affairs. Among theſe female warriors, it is ſaid, was one who excelled the reſt in ſtrength and valour. She aſſembled together an army of women, whom ſhe trained up in military diſcipline, and ſubdued ſome of the neighbouring nations. Afterwards, having by her valour increaſed her fame, ſhe led her army againſt the reſt; and being ſucceſsful, ſhe was ſo puffed up, that ſhe ſtyled herſelf the daughter of Mars, and ordered the men to ſpin wool, and do the work of the women within doors. She alſo made laws, by which the women were enjoined to go to the wars, and the men to be kept at home in a ſervile ſtate, and employed in the meaneſt offices. They alſo debilitated the arms and thighs of thoſe male children who were born to them, that they might be thereby rendered unfit for war. They ſeared the right breaſts of their girls, that they might be no hinderance to them in fighting: from whence they derived the name of Amazons. Their queen, having become extremely eminent for ſkill and knowledge in military affairs, at length built a large city at the mouth of the river Thermodoon, and adorned it with a magnificent palace. In her enterprizes ſhe exactly adhered to military diſcipline and good order; and ſhe added to her empire all the adjoining nations, even to the river Tanais. Having performed theſe exploits, ſhe at laſt ended her days like a hero, falling in a battle, in which ſhe had fought courageouſly. She was ſucceeded in the kingdom by her daughter, who imitated the valour of her mother, and in ſome exploits excelled her. She cauſed the girls from their very infancy to be exerciſed in hunting, and to be daily trained up in military exerciſes. She inſtituted ſolemn feſtivals and ſacrifices to Mars and Diana, which were named Tauropoli. She afterwards carried her arms beyond the river Tanais, and ſubdued all the people of thoſe regions, even unto Thrace. Returning then with a great quantity of ſpoils into her own kingdom, ſhe cauſed magnificent temples to be erected to the deities before mentioned; and ſhe gained the love of her ſubjects by her mild and gentle government. She afterwards undertook an expedition againſt thoſe who were on the other ſide of the river, and ſubjected to her dominion a great part of Aſia, extending her arms as far as Syria."

Diodorus alſo mentions another race of Amazons who dwelt in Africa; and whom he ſpeaks of as being of greater antiquity than thoſe who lived near the river Thermodoon. "In the weſtern parts of Lybia," ſays he, "upon the borders of thoſe tracts that are habitable, there was anciently a nation under the government of women, and whoſe manners and mode of living were altogether different from ours. It was the cuſtom for theſe women to manage all military affairs; and for a certain time, during which they preſerved their virginity, they went out as ſoldiers into the field. After ſome years employed in this manner, when the time appointed for this purpoſe was expired, they aſſociated themſelves with men, in order to obtain children. But the magiſtracy, and all public offices, they kept entirely in their own hands. The men, as the women are with us, were employed in houſehold affairs, ſubmitting themſelves wholly to the authority of their wives. They were not permitted to take any part in military,

Amazons. military affairs, or to have any command, or any public authority, which might have any tendency to encourage them to caſt off the yoke of their wives. As ſoon as any child was born, it was delivered to the father, to be fed with milk or ſuch other food as was ſuitable to its age. If females were born, they ſeared their breaſts, that they might not be burdenſome to them when they grew up; for they conſidered them as great hindrances in fighting."

Juſtinian repreſents the Amazonian republic to have taken its riſe in Scythia. The Scythians had a great part of Aſia under their dominion upwards of 400 years, till they were conquered by Ninus, the founder of the Aſſyrian empire. After his death, which happened about 1150 years before the Chriſtian æra, and that of Semiramis and their ſon Ninias, Ilinus and Scolopites, princes of the royal blood of Scythia, were driven from their country by other princes, who like them aſpired to the crown. They departed with their wives, children, and friends; and being followed by a great number of young people of both ſexes, they paſſed into Aſiatic Sarmatia, beyond mount Camaſſus, where they formed an eſtabliſhment, ſupplying themſelves with the riches they wanted, by making excurſions into the countries bordering on the Euxine Sea. The people of thoſe countries, exaſperated by the incurſions of their new neighbours, united, ſurpriſed, and maſſacred the men.

The women then reſolving to revenge their death, and at the ſame time to provide for their own ſecurity, reſolved to form a new kind of government, to chooſe a queen, enact laws, and maintain themſelves, without men, even againſt the men themſelves. This deſign was not ſo very ſurpriſing as at firſt ſight appears: for the greateſt number of the girls among the Scythians had been inured to the ſame exerciſes as the boys; to draw the bow, to throw the javelin, to manage other arms; to riding, hunting, and even the painful labours that ſeem reſerved for men; and many of them, as among the Sarmatians, accompanied the men in war. Hence they had no ſooner formed their reſolution, than they prepared to execute it, and exerciſed themſelves in all military operations. They ſoon ſecured the peaceable poſſeſſion of the country; and not content with ſhowing their neighbours that all their efforts to drive them thence or ſubdue them were ineffectual, they made war upon them, and extended their own frontiers. They had hitherto made uſe of the inſtructions and aſſiſtance of a few men that remained in the country; but finding at length that they could ſtand their ground, and aggrandize themſelves, without them, they killed all thoſe whom flight or chance had ſaved from the fury of the Sarmatians, and for ever renounced marriage, which they now conſidered as an inſupportable ſlavery. But as they could only ſecure the duration of their new kingdom by propagation, they made a law to go every year to the frontiers, to invite the men to come to them; to deliver themſelves up to their embraces, without choice on their part, or the leaſt attachment; and to leave them as ſoon as they were pregnant. All thoſe whom age rendered fit for propagation, and were willing to ſerve the ſtate by breeding girls, did not go at the ſame time in ſearch of men: for in order to obtain a right to promote the multiplication of the ſpecies, they muſt firſt have contributed to its deſtruction; nor was any thought worthy of giving birth to children till ſhe had killed three men. Amazons.

If from this commerce they brought forth girls, they educated them; but with reſpect to the boys, if we may believe Juſtin, they ſtrangled them at the moment of their birth: according to Diodorus Siculus, they twiſted their legs and arms, ſo as to render them unfit for military exerciſes; but Quintus Curtius, Philoſtratus, and Jordarus, ſay, that the leſs ſavage ſent them to their fathers. It is probable, that at firſt, when their fury againſt the men was carried to the greateſt height, they killed the boys: that when this fury abated, and moſt of the mothers were filled with horror at depriving the little creatures of the lives they had juſt received from them, they fulfilled the firſt duties of a mother; but, to prevent their cauſing a revolution in the ſtate, maimed them in ſuch a manner as to render them incapable of war, and employed them in the mean offices which theſe warlike women thought beneath them: in ſhort, that, when their conqueſts had confirmed their power, their ferocity ſubſiding, they entered into political engagements with their neighbours; and the number of the males they had preſerved becoming burthenſome, they, at the deſire of thoſe who rendered them pregnant, ſent them the boys, and continued ſtill to keep the girls.

As ſoon as the age of the girls permitted, they took away the right breaſt, that they might draw the bow with the greater force. The common opinion is, that they burnt that breaſt, by applying to it, at eight years of age, a hot brazen inſtrument, which inſenſibly dried up the fibres and glands: ſome think that they did not make uſe of ſo much ceremony, but that when the part was formed they got rid of it by amputation: ſome, again, with much greater probability, aſſert, that they employed no violent meaſures; but, by a continual compreſſion of that part from infancy, prevented its growth, at leaſt ſo far as to hinder its ever being incommodious in war.

Plutarch, treating of the Amazons in his life of Theſeus, conſiders the accounts which had been preſerved concerning them as partly fabulous and partly true. He gives ſome account of a battle which had been fought between the Athenians and the Amazons at Athens; and he relates ſome particulars of this battle which had been recorded by an ancient writer named Clidemus. He ſays, "That the left wing of the Amazons moved towards the place which is yet called Amazonium, and the right to a place called Pryx, near Chryſa; upon which the Athenians, iſſuing from behind the temple of the muſes, fell upon them; and that this is true, the graves of thoſe that were ſlain, to be ſeen in the ſtreets that lead to the gate Piraica, by the temple of the hero Chalcodue, are a ſufficient proof. And here it was that the Athenians were routed, and ſhamefully turned their backs to women, as far as to the temple of the Furies. But freſh ſupplies coming in from Palladium, Ardettus, and Lyceum, charged their right wing, and beat them back into their very tents; in which action a great number of the Amazons were ſlain." In another place he ſays, "It appears that the paſſage of the Amazons through Theſſaly was not without oppoſition; for there are yet to be ſeen many of their ſepulchres near Scotuſæa and Cynocephalæ." And in his life of Pompey, ſpeaking of the

Amazons

the Amazons, Plutarch fays, "They inhabit thofe parts of mount Caucafus that look towards the Hyrcanian fea (not bordering upon the Albanians, for the territories of the Getæ and the Leges lie betwixt): and with thefe people do they yearly, for two months only, accompany and cohabit, bed and board, near the river Thermodoon. After that they retire to their own habitations, and live alone all the reft of the year."

Quintus Curtius fays, "The nation of the Amazons is fituated upon the borders of Hyrcania, inhabiting the plains of Thermifcyra, near the river Thermodoon. Their queen was named Thaleftris, and fhe had under her fubjection all the country that lies between mount Caucafus and the river Phafis. This queen came out of her dominions, in confequence of an ardent defire fhe had conceived to fee Alexander; and being advanced near the place where he was, fhe previoufly fent meffengers to acquaint him, that the queen was come to have the fatisfaction of feeing and converfing with him. Having obtained permiffion to vifit him, fhe advanced with 300 of her Amazons, leaving the reft of her troops behind. As foon as fhe came within fight of the king, fhe leaped from her horfe, holding two javelins in her right hand. The apparel of the Amazons does not cover all the body; for their left fide is naked down to the ftomach, nor do the fkirts of their garments, which they tie up in a knot, reach below their knees. They preferve their left breaft entire, that they may be able to fuckle their female offspring; and they cut off and fear their right, that they may draw their bows, and caft their darts, with the greater eafe. Thaleftris looked at the king with an undaunted countenance, and narrowly examined his perfon; which did not, according to her ideas, come up to the fame of his great exploits: For the barbarians have a great veneration for a majeftic perfon, efteeming thofe only to be capable of performing great actions, on whom nature has conferred a dignified appearance. The king having afked her whether fhe had any thing to defire of him, fhe replied, without fcruple or hefitation, that fhe was come with a view to have children by him, fhe being worthy to bring him heirs to his dominions. Their offspring, if of the female fex, fhe would retain herfelf; and if of the male fex, it fhould be delivered to Alexander. He then afked her, whether fhe would accompany him in his wars? But this fhe declined, alleging, That fhe had left nobody to take care of her kingdom. She continued to folicit Alexander, that he would not fend her back without conforming to her wifhes; but it was not till after a delay of 13 days that he complied. She then returned to her own kingdom.

Juftin alfo repeatedly mentions this vifit of Thaleftris to Alexander; and in one place he fays, that fhe made a march of 25 days, in order to obtain this meeting with him. The interview between Alexander and Thaleftris is likewife mentioned by Diodorus Siculus. The learned Goropius, as he is quoted by Dr Petit, laments, in very pathetic terms, the hard fate of Thaleftris, who was obliged to travel fo many miles, and to encounter many hardfhips, in order to procure this interview with the Macedonian prince; and, from the circumftances, is led to confider the whole account as incredible. But Dr Petit, with equal erudition, with equal eloquence, and with fuperior force of reafoning, at length determines, that her journey was not founded upon irrational principles, and that full credit is due to thofe grave and venerable hiftorians by whom this tranfaction has been recorded.

Amazons.

The Amazons are reprefented as being armed with bows and arrows, with javelins, and alfo with an axe of a particular conftruction, which was denominated the axe of the Amazons. According to the elder Pliny, this axe was invented by Penthifilea, one of their queens. On many ancient medals are reprefentations of the Amazons, armed with thefe axes. They are alfo faid to have had bucklers in the fhape of a half-moon.

The Amazons are mentioned by many other ancient authors befides thofe which have been enumerated; and if any credit be due to the accounts concerning them, they fubfifted through feveral ages. They are reprefented as having rendered themfelves extremely formidable; as having founded cities, enlarged the boundaries of their dominions, and conquered feveral other nations.

That at any period there fhould have been women, who, without the affiftance of men, built cities and governed them, raifed armies and commanded them, adminiftered public affairs, and extended their dominion by arms, is undoubtedly fo contrary to all that we have feen and known of human affairs, as to appear in a very great degree incredible; but that women may have exifted fufficiently robuft and fufficiently courageous to have engaged in warlike enterprifes, and even to have been fuccefsful in them, is certainly not impoffible, however contrary to the ufual courfe of things. In fupport of this fide of the queftion, it may be urged, that women who have been early trained to warlike exercifes, to hunting, and to an hard and laborious mode of living, may be rendered more ftrong, and capable of more vigorous exertions, than men who have led indolent, delicate, and luxurious lives, and who have feldom been expofed even to the inclemencies of the weather. The limbs of women, as well as of men, are ftrengthened and rendered more robuft by frequent and laborious exercife. A nation of women, therefore, brought up and difciplined as the ancient Amazons are reprefented to have been, would be fuperior to an equal number of effeminate men; though they might be much inferior to an equal number of hardy men trained up and difciplined in the fame manner.

That much of what is faid of the Amazons is fabulous, there can be no reafonable doubt; but it does not therefore follow, that the whole is without foundation. The ancient medals and monuments on which they are reprefented are very numerous, as are alfo the teftimonies of ancient writers. It feems not rational to fuppofe that all this originated in fiction, though it may be much blended with it. The Abbé Guyon fpeaks of the hiftory of the Amazons as having been regarded by many perfons as fabulous, "rather from prejudice than from any real and folid examination;" and it muft be acknowledged, that the arguments in favour of their exiftence, from ancient hiftory, and from ancient monuments, are extremely powerful. The fact feems to be, that truth and fiction have been blended in the narrations concerning thefe ancient heroines.

Inftances of heroifm in women have occafionally occurred in modern times, fomewhat refembling that of the ancient Amazons. The times and the manners of chivalry in particular, by bringing great enterprifes, bold

Amazons. bold adventures, and extravagant heroiſm, into faſhion, inſpired the women with the ſame taſte. The women, in conſequence of the prevailing paſſion, were now ſeen in the middle of camps and of armies. They quitted the ſoft and tender inclinations, and the delicate offices of their own ſex, for the toils and the toilſome occupation of ours. During the cruſades, animated by the double enthuſiaſm of religion and of valour, they often performed the moſt romantic exploits; obtained indulgences on the field of battle, and died with arms in their hands, by the ſide of their lovers or of their huſbands.

In Europe, the women attacked and defended fortifications; princeſſes commanded their armies, and obtained victories. Such was the celebrated Joan de Montfort, diſputing for her duchy of Bretagne, and fighting herſelf. Such was that ſtill more celebrated Margaret of Anjou, active and intrepid general and ſoldier, whoſe genius ſupported a long time a feeble huſband; which taught him to conquer; which replaced him upon the throne; which twice relieved him from priſon; and, oppreſſed by fortune and by rebels, which did not bend till after ſhe had decided in perſon twelve battles.

The warlike ſpirit among the women, conſiſtent with ages of barbariſm, when every thing is impetuous becauſe nothing is fixed, and when all exceſs is the exceſs of force, continued in Europe upwards of 400 years, ſhowing itſelf from time to time, and always in the middle of convulſions or on the eve of great revolutions. But there were æras and countries in which that ſpirit appeared with particular luſtre. Such were the diſplays it made in the 15th and 16th centuries in Hungary, and in the iſlands of the Archipelago and the Mediterranean when they were invaded by the Turks.

Among the ſtriking inſtances of Amazonian conduct in modern ladies, may be mentioned that of Jane of Belleville, widow of Monſ. de Cliſſon, who was beheaded at Paris in the year 1343, on a ſuſpicion of carrying on a correſpondence with England and the Count de Montfort. This lady, filled with grief for the death of her late huſband, and exaſperated at the ill treatment which ſhe conſidered him as having received, ſent off "her ſon ſecretly to London; and when her apprehenſions were removed with reſpect to him, ſhe ſold her jewels, fitted out three ſhips, and put to ſea, to revenge the death of her huſband upon all the French with whom ſhe ſhould meet. This new corſair made ſeveral deſcents upon Normandy, where ſhe ſtormed caſtles; and the inhabitants of that province were ſpectators more than once, whilſt their villages were all in a blaze, of one of the fineſt women in Europe, with a ſword in one hand and a torch in the other, urging the carnage, and eyeing with pleaſure all the horrors of war."

We read in Mezeray, under the article of the Croiſade, preached by St Bernard in the year 1147, "That many women did not content themſelves with taking the croſs, but that they alſo took up arms to defend it, and compoſed ſquadrons of females, which rendered credible all that has been ſaid of the proweſs of the Amazons."

In the year 1590, the League party obtained ſome troops from the king of Spain. Upon the news of their being diſembarked, Barri de St Aunez, Henry IV.'s governor at Leucate, ſet out to communicate a ſcheme to the Duke de Montmorenci, commander in Amazons. that province. He was taken in his way by ſome of the troops of the League, who were alſo upon their march with the Spaniards towards Leucate. They were perſuaded, that by thus having the governor in their hands the gates of that place would be immediately opened to them, or at leaſt would not hold out long. But Conſtantia de Cecelli, his wife, after having aſſembled the garriſon, put herſelf ſo reſolutely at their head, pike in hand, that ſhe inſpired the weakeſt with courage; and the beſiegers were repulſed whereever they preſented themſelves. Shame and their great loſs having rendered them deſperate, they ſent a meſſage to this courageous woman, acquainting her, that if ſhe continued to defend herſelf they would hang her huſband. She replied with tears in her eyes, "I have riches in abundance: I have offered them, and I do ſtill offer them, for his ranſom; but I would not ignominiouſly purchaſe a life which he would reproach me with, and which he would be aſhamed to enjoy. I will not diſhonour him by treaſon againſt my king and country." The beſiegers having made a freſh attack without ſucceſs, put her huſband to death, and raiſed the ſiege. Henry IV. afterwards ſent to this lady the brevet of governeſs of Leucate, with the reverſion for her ſon.

The famous Maid of Orleans, alſo, is an example known to every reader.

The Abbé Arnaud, in his Memoirs, ſpeaks of a Counteſs of St Balmont, who uſed to take the field with her huſband and fight by his ſide. She ſent ſeveral Spaniſh priſoners of her taking to Marſhal Feuquiers; and what is not a little extraordinary, this Amazon at home was all affability and ſweetneſs, and gave herſelf up to reading and acts of piety.

Dr Johnſon ſeems to have given ſome credit to the accounts which have been tranſmitted down to us concerning the ancient Amazons; and he has endeavoured to ſhow, that we ought not haſtily to reject ancient hiſtorical narrations becauſe they contain facts repugnant to modern manners, and exhibit ſcenes to which nothing now occurring bears a reſemblance. "Of what we know not (ſays he), we can only judge by what we know. Every novelty appears more wonderful as it is more remote from any thing with which experience or teſtimony have hitherto acquainted us; and if it paſſes farther, beyond the notions that we have been accuſtomed to form, it becomes at laſt incredible. We ſeldom conſider, that human knowledge is very narrow; that national manners are formed by chance; that uncommon conjunctures of cauſes produce rare effects; or that what is impoſſible at one time or place may yet happen in another. It is always eaſier to deny than to enquire. To refuſe credit confers for a moment an appearance of ſuperiority which every little mind is tempted to aſſume, when it may be gained ſo cheaply as by withdrawing attention from evidence, and declining the fatigue of comparing probabilities. Many relations of travellers have been ſlighted as fabulous, till more frequent voyages have confirmed their veracity; and it may reaſonably be imagined, that many ancient hiſtorians are unjuſtly ſuſpected of falſehood, becauſe our own times afford nothing that reſembles what they tell. Few narratives will either to men or women appear more incredible than the hiſtories of the Amazons; of female nations, of whoſe conſtitution

ſtitution it was the eſſential and fundamental law, to exclude men from all participation either of public affairs or domeſtic buſineſs; where female armies marched under female captains, female farmers gathered the harveſt, female partners danced together, and female wits diverted one another. Yet ſeveral ages of antiquity have tranſmitted accounts of the Amazons of Caucaſus; and of the Amazons of America, who have given their name to the greateſt river in the world, Condamine lately found ſuch memorials as can be expected among erratic and unlettered nations, where events are recorded only by tradition, and new ſwarms ſettling in the country from time to time confuſe and efface all traces of former times."

No author has taken ſo much pains upon this ſubject as Dr Petit. But, in the courſe of his work, he has given it as his opinion, that there is great difficulty in governing the women even at preſent, though they are unarmed and unpractiſed in the art of war. After all his elaborate inquiries and diſcuſſions, therefore, this learned writer might probably think, that it is not an evil of the firſt magnitude that the race of Amazons now ceaſes to exiſt.

Rouſſeau ſays, "The empire of the woman is an empire of ſoftneſs, of addreſs, of complacency. Her commands are careſſes, her menaces are tears." But the empire of the Amazons was certainly an empire of a very different kind. Upon the whole, we may conclude with Dr Johnſon: "The character of the ancient Amazons was rather terrible than lovely. The hand could not be very delicate that was only employed in drawing the bow and brandiſhing the battle-axe. Their power was maintained by cruelty, their courage was deformed by ferocity; and their example only ſhows, that men and women live beſt together."

Amazons (the river of), in America. See Amazonia.

Amazonian Habit, in antiquity, denotes a dreſs formed in imitation of the Amazons. Marcia, the famous concubine of the emperor Commodus, had the appellation of *Amazonian*, becauſe ſhe charmed him moſt in a habit of this kind. Hence alſo that prince himſelf engaged in combat in the amphitheatre in an Amazonian habit; and of all titles the *Amazonius* was one of thoſe he moſt delighted in.—In honour either of the gallant or his miſtreſs, the month December was alſo denominated *Amazonius*—Some alſo apply *Amazonian habit* to the hunting-dreſs worn by many ladies among us.

AMBA, an Abyſſinian or Ethiopic word, ſignifying a *rock*. The Abyſſinians give names to each of their rocks, as *Amba-Dorho*, the rock of a hen, &c. Some of theſe rocks are ſaid to have the name of *Aorni;* and are of ſuch a ſtupendous height, that the Alps and Pyrenees are but low hills in compariſon of them. Amongſt the mountains, and even frequently in the plains, of this country, ariſe ſteep and craggy rocks of various forms, ſome reſembling towers, others pyramids, &c. ſo perpendicular and ſmooth on the ſides, that they ſeem to be works of art; inſomuch, that men, cattle, &c. are craned up by the help of ladders and ropes: and yet the tops of theſe rocks are covered with woods, meadows, fountains, fiſhponds, &c. which very copiouſly ſupply the animals ſeated thereon with all the conveniences of life. The moſt remarkable of theſe rocks is called *Amba-Geſhen*. It is prodigiouſly ſteep, in the form of a caſtle built of free ſtone, and almoſt impregnable. Its ſummit is about half a Portugueſe league in breadth, and the circumference at the bottom about half a day's journey. The aſcent at firſt is eaſy; but grows afterwards ſo ſteep, that the Abaſſine oxen, which will otherwiſe clamber like goats, muſt be craned up, and let down with ropes. Here the princes of the blood were formerly confined, in low cottages amongſt ſhrubs and wild cedars, with an allowance barely ſufficient to keep them alive. There is, according to Kircher, in this country, a rock ſo curiouſly hollowed by nature, that at a diſtance it reſembles a looking-glaſs; and oppoſite to this another, on the top of which nothing can be ſo ſoftly whiſpered but it may be heard a great way off. Between many of theſe rocks and mountains are vaſt abyſſes, which appear very dreadful to the eye.

AMBACHT, in topography, denotes a kind of juriſdiction or territory, the poſſeſſor whereof has the adminiſtration of juſtice both in *alto* and *baſſo;* or of what is called in the Scots law *a power of pit and gallows*, i. e. a power of drowning and hanging.—In ſome ancient writers, ambacht is particularly uſed for the juriſdiction, government, or chief magiſtracy of a city. The word is very ancient, though uſed originally in a ſenſe ſomewhat different. Ennius calls a mercenary, or ſlave hired for money, *ambactus;* and Cæſar gives the ſame appellation to a kind of dependents among the Gauls, who, without being ſlaves, were attached to the ſervice of great lords.

AMBAGES. See Circumlocution.

AMBARVALIA, in antiquity, a ceremony among the Romans, when, in order to procure from the gods an happy harveſt, they conducted the victims thrice round the corn-fields in proceſſion, before ſacrificing them.—*Ambarvalia* were either of a private or public nature: the private were performed by the maſter of a family; and the public by the prieſts who officiated at the ſolemnity, called *fratres ovales*. The prayer preferred on this occaſion, the formula of which we have in Cato *de Re Ruſtica*, cap. cxlii. was called *carmen ambervale*. At theſe feaſts they ſacrificed to Ceres a ſow, a ſheep, and a bull or heifer, whence they took the name of *ſuovetaurilia*. The method of celebrating them was, to lead a victim round the fields, while the peaſants accompanied it, and one of their number, crowned with oak, hymned forth the praiſes of Ceres, in verſes compoſed on purpoſe. This feſtival was celebrated twice a-year; at the end of January, according to ſome, or in April, according to others; and for the ſecond time, in the month of July.

AMBASSADOR, or Embassador, a public miniſter ſent from one ſovereign prince, as a repreſentative of his perſon to another.

Ambaſſadors are either ordinary or extraordinary. Ambaſſador *in ordinary*, is he who conſtantly reſides in the court of another prince, to maintain a good underſtanding, and look to the intereſt of his maſter. Till about two hundred years ago, ambaſſadors in ordinary were not heard of: all, till then, were ambaſſadors *extraordinary;* that is, ſuch as are ſent on ſome particular occaſion, and who retire as ſoon as the affair is diſpatched.

By the law of nations, none under the quality of a ſovereign prince can ſend or receive an ambaſſador. At Athens, ambaſſadors mounted the pulpit of the public

 orators,

orators, and there opened their commiſſion, acquainting the people with their errand. At Rome, they were introduced to the ſenate, and delivered their commiſſions to the fathers.

Ambaſſadors ſhould never attend any public ſolemnities, as marriages, funerals, &c. unleſs their maſters have ſome intereſt therein: nor muſt they go into mourning on any occaſions of their own, becauſe they repreſent the perſon of their prince. By the civil law, the moveable goods of an ambaſſador, which are accounted an acceſſion to his perſon, cannot be ſeized on, neither as a pledge, nor for payment of a debt, nor by order or execution of judgment, nor by the king's or ſtate's leave where he reſides, as ſome conceive; for all actions ought to be far from an ambaſſador, as well that which toucheth his neceſſaries, as his perſon: if, therefore, he hath contracted any debt, he is to be called upon kindly; and if he refuſes, then letters of requeſt are to go to his maſter. Nor can any of the ambaſſador's domeſtic ſervants that are regiſtered in the ſecretaries of ſtate's office be arreſted in perſon or goods; if they are, the proceſs ſhall be void, and the parties ſueing out and executing it ſhall ſuffer and be liable to ſuch penalties and corporal puniſhment as the lord chancellor or either of the chief juſtices ſhall think fit to inflict. Yet ambaſſadors cannot be defended when they commit any thing againſt that ſtate, or the perſon of the prince, with whom they reſide; and if they are guilty of treaſon, felony, &c. or any other crime againſt the law of nations, they loſe the privilege of an ambaſſador, and may be ſubject to puniſhment as private aliens.

AMBE, in *ſurgery*, the name of an inſtrument for reducing diſlocated bones. In *anatomy*, a term for the ſuperficial jutting out of a bone.

AMBER (*Succinum*), in natural hiſtory, a ſolid, hard, ſemipellucid, bituminous ſubſtance of a particular nature, of uſe in medicine and in ſeveral of the arts. It has been called *ambra* by the Arabians, and *electrum* by the Greeks.

Amber has been of great repute in the world from the earlieſt times. Many years before Chriſt it was in eſteem as a medicine; and Plato, Ariſtotle, Herodotus, Æſchylus, and others, have commended its virtues. In the times of the Romans it became in high eſteem as a gem; and in the luxurious reign of Nero, immenſe quantities of it were brought to Rome, and uſed for ornamenting works of various kinds.

The moſt remarkable property of this ſubſtance is, that, when rubbed, it draws or attracts other bodies to it: and this, it is obſerved, it does, even to thoſe ſubſtances which the ancients thought it had an antipathy to; as oily bodies, drops of water, human ſweat, &c. Add, that by the friction it is brought to yield light pretty copiouſly in the dark; whence it is reckoned among the native phoſphori.

The property which amber poſſeſſes of attracting light bodies, was very anciently obſerved. Thales of Miletus, 600 years before Chriſt, concluded from hence that it was animated. But the firſt perſon who expreſly mentions this ſubſtance, is Theophraſtus, about the year 300 before Chriſt. The attractive property of amber is likewiſe occaſionally taken notice of by Pliny, and other later naturaliſts, particularly by Gaſſendus, Kenelm Digby, and Sir Thomas Brown; but it was generally apprehended that this quality was peculiar to amber and jet, and perhaps agate, till Gilbert publiſhed his treatiſe *De Magnete*, in the year 1600. From ηλεκτρον, the Greek name for amber, is derived the term *Electricity*, which is now very extenſively applied not only to the power of attracting light bodies inherent in amber, but to other ſimilar powers, and their various effects, in whatever bodies they reſide, or to whatever bodies they may be communicated.

Amber aſſumes all figures in the ground; that of a pear, an almond, a pea, &c. In amber there have been ſaid to be letters found very well formed; and even Hebrew and Arabic characters.—Within ſome pieces, leaves, inſects, &c. have likewiſe been found included; which ſeems to indicate, either that the amber was originally in a fluid ſtate, or that having been expoſed to the ſun, it was once ſoftened, and rendered ſuſceptible of the leaves, inſects, &c. which came in its way. The latter of theſe ſuppoſitions ſeems the more agreeable to the phenomenon, becauſe thoſe inſects, &c. are never found in the centre of the pieces of amber, but always near the ſurface. It is obſerved by the inhabitants of thoſe places where amber is produced, that all animals, whether terreſtrial, aerial, or acquatic, are extremely fond of it, and that pieces of it are frequently found in their excrements. The bodies of inſects, found buried in amber, are viewed with admiration by all the world; but of the moſt remarkable of theſe, many are to be ſuſpected as counterfeit, the great price at which beautiful ſpecimens of this kind ſell, having tempted ingenious cheats to introduce animal bodies in ſuch artful manners into ſeemingly whole pieces of amber, that it is not eaſy to detect the fraud.

Of thoſe inſects which have been originally incloſed in amber, ſome are plainly ſeen to have ſtruggled hard for their liberty, and even to have left their limbs behind them in the attempt; it being no unuſual thing to ſee, in a maſs of amber that contains a ſtout beetle, the animal wanting one, or perhaps two of its legs; and thoſe legs left in different places, nearer that part of the maſs from which it has travelled. This alſo may account for the common accident of finding legs, or wings of flies, without the reſt of their bodies, in pieces of amber; the inſects having, when entangled in the yet ſoft and viſcid matter, eſcaped, at the expence of leaving thoſe limbs behind them. Drops of clear water are ſometimes alſo preſerved in amber. Theſe have doubtleſs been received into it while ſoft, and preſerved by its hardening round them. Beautiful leaves of a pinnated ſtructure, reſembling ſome of the ferns, or maidenhairs, have been found in ſome pieces; but theſe are rare, and the ſpecimens of great value. Mineral ſubſtances are alſo found at times lodged in maſſes of amber. Some of the pompous collections of the German princes boaſt of ſpecimens of native gold and ſilver in maſſes of amber; but as there are many ſubſtances of the marcaſite, and other kinds, that have all the glittering appearance of gold and ſilver, it is not to be too haſtily concluded that theſe metals are really lodged in theſe beds of amber. Iron is found in various ſhapes immerſed in amber; and as it is often ſeen eroded, and ſometimes in the ſtate of vitriol, it is not impoſſible but that copper, and the other metals, may be alſo ſometimes immerſed in it in the ſame ſtate: hence the bluiſh and greeniſh colours, frequently found in the recent pieces of amber, may be owing, like the

Amber. particles of the gem colours, to thofe metals; but as the gems, by their denfe texture, always retain their colours, this lighter and more lax bitumen ufually lofes what it gets of this kind, by keeping fome time. Small pebbles, grains of fand, and fragments of other ftones, are not unfrequently alfo found immerfed in amber.

Naturalifts have been greatly divided as to the origin of this fubftance, and what clafs of bodies it belongs to; fome referring it to the vegetable, others to the mineral, and fome even to the animal kingdom. Pliny defcribes it as "a refinous juice, oozing from "aged pines and firs (others fay from poplars, where-"of there are whole forefts on the coafts of Sweden), "and difcharged thence into the fea, where, undergo-"ing fome alteration, it is thrown, in this form, upon "the fhores of Pruffia, which lie very low: he adds, "that it was hence the ancients gave it the denomi-"nation *fuccinum*; from *fuccus*, juice."

Some fuppofe amber a compound fubftanee. Pruffia, fay they, and the other countries which produce amber, are moiftened with a bituminous juice, which mixing with the vitriolic falts abounding in thofe places, the points of thofe falts fix its fluidity, whence it congeals; and the refult of that congelation makes what we call amber; which is more or lefs pure, tranfparent, and firm, as thofe parts of falt and bitumen are more or lefs pure, and are mixed in this or that proportion.

Mr Brydone, in his tour to Sicily and Malta, fays, that the river Gearetta, formerly celebrated by the poets under the name of Simetus, throws up near its mouth great quantities of amber. He mentions alfo a kind of artificial amber, not uncommon there, made, as he was told, from copal, but very different from the natural.

According to Hartman, amber is formed of a bitumen, mixed with vitriol and other falts. But though this were allowed him in regard to the foffile amber, many difpute whether the fea-amber be fo produced. It is, however, apparent, that all amber is of the fame origin, and probably that which is found in the fea has been wafhed thither out of the cliffs; though Hartman thinks it very poffible, that fome of it may be formed in the earth under the fea, and be wafhed up thence. The fea-amber is ufually finer to the eye than the foffile; but the reafon is, that it is divefted of that coarfe coat with which the other is covered while in the earth.

Upon the whole, it feems generally agreed upon, that amber is a true bitumen of foffile origin.—In a late volume of the *Journal de Phyfique*, however, we find it afferted by Dr Girtanner to be an animal product, a fort of honey or wax formed by a fpecies of large ant called by Linnæus *formica rufa*. Thefe ants, our author informs us, inhabit the old pine forefts, where they fometimes form hills about fix feet in diameter; and it is generally in thefe ancient forefts, or in places where they have been, that foffile amber is found. This fubftance is not hard as that which is taken up in the fea at Pruffia, and which is well known to naturalifts. It has the confiftence of honey or of half melted wax, but it is of a yellow colour like common amber; it gives the fame product by chemical analyfis, and it hardens like the other when it is fuffered to remain fome time in a folution of common falt. This accounts for the infects that are fo often found inclofed in it. Among thefe infects ants are always the moft prevailing; which tends farther, Mr Girtanner thinks, to the confirmation of his hypothefis. Amber then, in his opinion, is nothing but a vegetable oil rendered concrete by the acid of ants, juft as wax is nothing but an oil hardened by the acid of bees; a fact inconteftably proved, we are told, fince Mr Metherie has been able to make artificial wax by mixing oil of olives with the nitrous acid, and which wax is not to be diftinguifhed from the natural.

There are feveral indications which difcover where amber is to be found. The furface of the earth is there covered with a foft fcaly ftone; and vitriol in particular always abounds there, which is fometimes found white, fometimes reduced into a matter, like melted glafs, and fometimes figured like petrified wood.

Amber of the fineft kind has been found in England. It is frequently thrown on the fhores of Yorkfhire, and many other places, and found even in our clay-pits; the pits dug for tile-clay, between Tyburn and Kenfington gravel-pits, and that behind St George's Hofpital at Hyde-park corner, have afforded fine fpecimens.

Poland, Silefia, and Bohemia, are famous for the amber dug up there at this time. Germany affords great quantities of amber, as well dug up from the bowels of the earth, as toffed about on the fhores of the fea and rivers there. Saxony, Mifnia, and Sweden, and many other places in this tract of Europe, abound with it. Denmark has afforded, at different times, feveral quantities of foffile amber; and the fhores of the Baltic abound with it. But the countries lying on the Baltic afford it in the greateft abundance of all; and of thefe the moft plentiful country is Pruffia, and the next is Pomerania. Pruffia was, as early as the times of Theodoric the Goth, famous for amber; for this fubftance coming into great repute with this prince, fome natives of Pruffia, who were about his court, offered their fervice to go to their own country, where that fubftance, they faid, was produced, and bring back great ftores of it. They accordingly did fo; and from this time Pruffia had the honour to be called the Country of Amber, inftead of Italy, which had before undefervedly that title. This article alone brings his Pruffian Majefty a revenue of 26,000 dollars annually. The amber of Pruffia is not only found on the fea-coafts, but in digging; and though that of Pomerania is generally brought from the fhores, yet people who dig, on different occafions, in the very heart of the country, at times find amber.

Junker defcribes, after Neumann, the Pruffian amber-mines, which are the richeft known.—Firft, at the furface of the earth, is found a ftratum of fand. Immediately under this fand is a bed of clay, filled with fmall flints of about an inch diameter each. Under this clay lies a ftratum of black earth, or turf, filled with foffile wood, half decompofed, and bituminous; this ftratum is extended upon a bank of minerals, containing little metal, except iron, which are confequently pyrites. Laftly, under this bed the amber is found, fcattered about in pieces, or fometimes accumulated in heaps.

Amber has a fubacrid refinous tafte, and fragrant aromatic fmell, efpecially when diffolved. It differs from the other bituminous fubftances in this, that it yields by diftillation a volatile acid falt, which none of the others do; otherwife it affords the fame fort of principles

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principles as them, viz. an acid phlegm, an oil which gradually becomes thicker as the diſtillation is continued; and when the operation is finiſhed, there remains a black caput mortuum in the retort.—When boiled in water, it neither ſoftens, nor undergoes any ſenſible alteration. Expoſed to the fire in an open veſſel, it melts into a black maſs very like a bitumen: It is partly ſoluble in ſpirit of wine, and likewiſe in ſome eſſential oils; but it is with difficulty that the expreſſed ones are brought to act upon it; the ſtronger ſorts of fixed alkaline lixivia almoſt totally diſſolve it.

This ſubſtance is principally of two colours, white and yellow. The white is the moſt eſteemed for medicinal purpoſes, as being the moſt odoriferous, and containing the greateſt quantity of volatile ſalt; tho' the yellow is moſt valued by thoſe who manufacture beads and other toys with it, by reaſon of its tranſparency.

Amber is the baſis of all varniſhes, by ſolution in the ways deſcribed under the article Varnish.

Amber, when it has once been melted, irrecoverably loſes its beauty and hardneſs. There have been ſome, however, who pretended they had an art of melting ſome ſmall pieces of amber into a maſs, and conſtituting large ones of them: but this ſeems ſuch another undertaking as the making of gold; all the trials that have yet been made by the moſt curious experimenters, proving, that the heat which is neceſſary to melt amber, is ſufficient to deſtroy it. Phil. Tranſ. N° 248. p. 25.

Could amber indeed be diſſolved without impairing its tranſparency, or one large maſs be made of it by uniting ſeveral ſmall ones, it is eaſy to ſee what would be the advantages of ſuch a proceſs. The art of embalming might poſſibly be alſo carried to a great height by this, if we could preſerve the human corpſe in a tranſparent caſe of amber, as the bodies of flies, ſpiders, graſhoppers, &c. are to a great perfection. Something of a ſubſtitute of this kind we have in fine roſin; which being diſſolved by heat, and the bodies of ſmall animals ſeveral times dipped in it, they are thus coated with colophony, that in ſome degree reſembles amber; but this muſt be kept from duſt.

Amber in ſubſtance has been much recommended as a nervous and cordial medicine; and alleged to be very efficacious in promoting the menſtrual diſcharge, and the excluſion of the fœtus and ſecundines in labour: but as in its crude ſtate it is quite inſoluble by our juices, it certainly can have very little effect on the animal ſyſtem, and therefore it is now ſeldom given in ſubſtance. The forms in which amber is prepared are, A tincture, a ſalt, and an oil; the preparation and uſes of which are deſcribed in the proper place under the article Pharmacy.

Amber-Tree, the Engliſh name of a ſpecies of Anthospermum.

AMBERG, a city of Germany, the capital of the palatinate of Bavaria, with a good caſtle, ramparts, baſtions, and deep ditches. It is ſeated near the confines of Franconia, on the river Wils. It drives a great trade in iron and other metals, found in the neighbouring mountains. E. Long. 12. 4. N. Lat. 20. 46.

AMBERGREASE, Ambergrise, or Grey Amber, in natural hiſtory, is a ſolid, opake, aſh-coloured, fatty, inflammable ſubſtance, variegated like marble, remarkably light, rugged and uneven in its ſurface, and has a fragrant odour when heated. It does not efferveſce with acids; it melts freely over the fire, into a kind of yellow roſin; and is hardly ſoluble in ſpirit of wine.

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It is found ſwimming upon the ſea, or the ſea-coaſt, or in the ſand near the ſea-coaſt; eſpecially in the Atlantic ocean, on the ſea-coaſt of Braſil, and that of Madagaſcar; on the coaſt of Africa, of the Eaſt Indies, China, Japan, and the Molucca iſlands; but moſt of the ambergriſe which is brought to England comes from the Bahama iſlands, from Providence, &c. where it is found on the coaſt. It is alſo ſometimes found in the abdomen of whales by the whale-fiſhermen, always in lumps of various ſhapes and ſizes, weighing from half an ounce to an hundred and more pounds. The piece which the Dutch Eaſt India Company bought from the king of Tydor, weighed 182 pounds. An American fiſherman from Antigua found ſome years ago, about 52 leagues ſouth-eaſt from the Windward Iſlands, a piece of ambergriſe in a whale, which weighed about 130 pounds, and ſold for 500 l. Sterling.

There have been many different opinions concerning the origin of this ſubſtance.

It has been ſuppoſed to be a foſſile bitumen or naphtha, exuding out of the bowels of the earth in a fluid form, and diſtilling into the ſea, where it hardens and floats on the ſurface. But having been frequently found in the belly of whales, it has by others been conſidered as entirely an animal production.

Cluſius aſſerted it to be a phlegmatic recrement, or indurated indigeſtible part of the food, collected and found in the ſtomach of the whale, in the ſame manner as the bezoars are found in the ſtomach of other animals.

In an account communicated by Paul Dudley, Eſq; in the 23d volume of the Philoſophical Tranſactions, the ambergiſe found in whales is repreſented as a kind of animal product, like muſk, and caſtoreum, &c. ſecreted and collected in a peculiar bag or bladder, which is furniſhed with an excretory duct or canal, the ſpout of which runs tapering into and through the length of the penis; and that this bag, which lies juſt over the teſticles, is almoſt full of a deep orange-coloured liquor, not quite ſo thick as oil, of the ſame ſmell as the balls of ambergriſe, which float and ſwim looſe in it: which colour and liquor may alſo be found in the canal of the penis; and that therefore ambergriſe is never to be found in any female, but in the male only. But theſe circumſtances are not only deſtitute of truth, but alſo contrary to the laws of the animal œconomy: For, in the firſt place, ambergriſe is frequently found in females as well as males; although that found in females is never in ſuch large pieces, nor of ſo good a quality, as what is found in males. Secondly, No perſon who has the leaſt knowledge in anatomy or phyſiology, will ever believe that organiſed bodies, ſuch as the beaks of the Sepia, which are ſo conſtantly found in ambergriſe taken out of the whale, can have been abſorbed from the inteſtines by the lacteals or lymphatics, and collected with the ambergriſe in the precluded bag abovementioned.

Kæmpfer, who has given us ſo many other faithful accounts in natural hiſtory, ſeems to come nearer the truth

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truth with regard to the origin of ambergrife, when he fays, that it is the dung of the whale; and that the Japanefe, for this reafon, call it *kufura no fuu*, i. e. whale's dung. This account, however, though founded on obfervation, has never obtained credit, but has been confidered rather as a fabulous ftory, with which the Japanefe impofed upon him, who had himfelf no direct obfervation to prove the fact.

This matter, therefore, remained a fubject of great doubt; and it was generally thought to be more probable, that ambergrife, after having been fwallowed, and fomehow or other changed in the ftomach and bowels of the whale, was found among its excrements.

But the moft fatisfactory account of the real origin of ambergrife, is that given by Dr Swediar in the 73d volume of the Philofophical Tranfactions, art. 15.

We are told by all writers on ambergrife, that fometimes claws and beaks of birds, feathers of birds, parts of vegetables, fhells, fifh, and bones of fifh, are found in the middle of it, or varioufly mixed with it. Of a very large quantity of pieces, however, which the Doctor examined, he found none that contained any fuch thing; though he allows, that fuch fubftances may fometimes be found in it: but in all the pieces of any confiderable fize, whether found on the fea or in the whale, he conftantly found a confiderable quantity of black fpots, which, after the moft careful examination, appeared to be the beaks of the *Sepia Octopodia;* and thefe beaks, he thinks, might be the fubftances which have hitherto been always miftaken for claws or beaks of birds, or for fhells.

The prefence of thefe beaks in ambergrife proves evidently, that all ambergrife containing them is in its origin, or muft have been once, of a very foft or liquid nature, as otherwife thofe beaks could not fo conftantly be intermixed with it throughout its whole fubftance.

That ambergrife is found either upon the fea and fea-coaft, or in the bowels of whales, is a matter of fact univerfally credited. But it has never been examined into and determined, whether the ambergrife found upon the fea and fea-coaft is the fame as that found in the whale, or whether they are different from one another? Whether that found on the fea or fea-coaft has fome properties, or conftituent parts, which that found in the whale has not? And laftly, Whether that found in the whale is fuperior or inferior in its qualities and value to the former?

It is likewife a matter of confequence to know, Whether ambergrife is found in all kinds of whales, or only in a particular fpecies of them? Whether it is conftantly and always to be met with in thofe animals? And, if fo, in what part of their body it is to be found?

All thefe queftions we find very fatisfactorily difcuffed by Dr Swediar.

According to the beft information that he could obtain from feveral of the moft intelligent perfons employed in the fpermaceti whale-fifhery, and in procuring and felling ambergrife, it appears, that this fubftance is fometimes found in the belly of the whale, but in that particular fpecies only which is called the *fpermaceti whale*, and which from its defcription and delineation appears to be the *Physeter Macrocephalus* Linnæi.

The New England fifhermen, according to their account, have long known that ambergrife is to be found in the fpermaceti whale; and they are fo convinced of this fact, that whenever they hear of a place where ambergrife is found, they always conclude that the feas in that part are frequented by this fpecies of whale.

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The perfons who are employed in the fpermaceti whale-fifhery, confine their views to the Phyfeter macrocephalus. They look for ambergrife in all the fpermaceti whales they catch, but it feldom happens that they find any. Whenever they hook a fpermaceti whale, they obferve, that it conftantly not only vomits up whatever it has in its ftomach, but alfo generally difcharges its fæces at the fame time; and if this latter circumftance takes place, they are generally difappointed in finding ambergrife in its belly. But whenever they difcover a fpermaceti whale, male or female, which feems torpid and fickly, they are always pretty fure to find ambergrife, as the whale in this ftate feldom voids its fæces upon being hooked. They likewife generally meet with it in the dead fpermaceti whales, which they fometimes find floating on the fea. It is obferved alfo, that the whale, in which they find ambergrife, often has a morbid protuberance; or, as they exprefs it, a kind of gathering in the lower part of its belly, in which, if cut open, ambergrife is found. It is obferved, that all thofe whales, in whofe bowels ambergrife is found, feem not only torpid and fick, but are alfo conftantly leaner than others; fo that, if we may judge from the conftant union of thefe two circumftances, it would feem that a larger collection of ambergrife in the belly of the whale is a fource of difeafe, and probably fometimes the caufe of its death. As foon as they hook a whale of this defcription, torpid, fickly, emaciated, or one that does not dung on being hooked, they immediately either cut up the above-mentioned protuberance, if there be any, or they rip open its bowels from the orifice of the anus, and find the ambergrife, fometimes in one fometimes in different lumps, of generally from three to twelve and more inches in diameter, and from one pound to twenty or thirty pounds in weight, at the diftance of two, but moft frequently of about fix or feven feet from the anus, and never higher up in the inteftinal canal; which, according to their defcription, is, in all probability, the inteftinum cæcum, hitherto miftaken for a peculiar bag made by nature for the fecretion and collection of this fingular fubftance. That the part they cut open to come at the ambergrife is no other than the inteftinal canal is certain, becaufe they conftantly begin their incifion at the anus, and find the cavity everywhere filled with the fæces of the whale, which from their colour and fmell it is impoffible for them to miftake. The ambergrife found in the inteftinal canal is not fo hard as that which is found on the fea or fea-coaft, but foon grows hard in the air: when firft taken out it has nearly the fame colour, and the fame difagreeable fmell, though not fo ftrong, as the more liquid dung of the whale has; but, on expofing it to the air, it by degrees not only grows greyifh, and its furface is covered with a greyifh duft like old chocolate, but it alfo lofes its difagreeable fmell, and, when kept for a certain length of time, acquires the peculiar odour which is fo agreeable to moft people.

The gentlemen the Doctor converfed with confeffed, that if they knew not from experience that ambergrife thus found will in time acquire the above-mentioned

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Amber-greafe.

qualities, they would by no means be able to diftinguifh ambergrife from hard indurated fæces. This is fo true, that whenever a whale voids its fæces upon being hooked, they look carefully to fee if they cannot difcover among the more liquid excrements (of which the whale difcharges feveral barrels) fome pieces floating on the fea, of a more compact fubftance than the reft; thefe they take up and wafh, knowing them to be ambergrife.

In confidering whether there be any material difference between ambergrife found upon the fea or fea-coaft, and that found in the bowels or among the dung of the whale, the Doctor refutes the opinion, that all ambergrife found in whales is of an inferior quality, and therefore much lefs in price. Ambergrife, he obferves, is only valued for its purity, lightnefs, compactnefs, colour, and fmell. There are pieces of ambergrife found on different coafts, which are of a very inferior quality; whereas there are often found in whales pieces of it of the firft value; nay, feveral pieces found in the fame whale, according to the above-mentioned qualities, are more or lefs valuable. All ambergrife found in whales has at firft when taken out of the inteftines very near the fame fmell as the liquid excrements of that animal have; it has then alfo nearly the fame blackifh colour: they find it in the whale fometimes quite hard, fometimes rather foftifh, but never fo liquid as the natural fæces of that animal. And it is a matter of fact, that, after being taken out and kept in the air, all ambergrife grows not only harder and whiter, but alfo lofes by degrees its fmell, and affumes fuch an agreeable one, as that in general has which is found fwimming upon the fea; therefore the goodnefs of ambergrife feems rather to depend on its age. By being accumulated after a certain length of time in the inteftinal canal, it feems even then to become of a whiter colour, and lefs ponderous, and acquire its agreeable fmell. The only reafon why ambergrife found floating on the fea generally poffeffes the above-mentioned qualities in a fuperior degree, is becaufe it is commonly older, and has been longer expofed to the air. It is more frequently found in males than females; the pieces found in females are in general fmaller, and thofe found in males feem conftantly to be larger and of a better quality; and therefore the high price in proportion to the fize is not merely imaginary for the rarity-fake, but in fome refpect well founded, becaufe fuch large pieces appear to be of a greater age, and poffefs the above-mentioned qualities in general in a higher degree of perfection than fmaller pieces.

It is known, that the Sepia octopodia, or cuttle-fifh, is the conftant and natural food of the fpermaceti whale, or Phyfeter macrocephalus. Of this the fifhers are fo well perfuaded, that whenever they difcover any recent relics of it fwimming on the fea, they conclude that a whale of this kind is, or has been, in that part. Another circumftance which corroborates the fact is, that the fpermaceti whale on being hooked generally vomits up fome remains of the Sepia. Hence it is eafy to account for the many beaks, or pieces of beaks, of the Sepia found in all ambergrife. The beak of the Sepia is a black horny fubftance, and therefore paffes undigefted through the ftomach into the inteftinal canal, where it is mixed with the fæces; after which it is either evacuated with them, or if thefe latter be preternaturally retained, forms concretions with them, which render the animal fick and torpid, and produce an obftipation, which ends either in an abfcefs of the abdomen, as has been frequently obferved, or becomes fatal to the animal; whence in both the cafes, on the burfting of its belly, that hardened fubftance, known under the name of *ambergrife*, is found fwimming on the fea, or thrown upon the coaft.

From the preceding account, and his having conftantly found the above-mentioned beaks of the Sepia in all pieces of ambergrife of any confiderable fize, Dr Swediar concludes with great probability, that all ambergrife is generated in the bowels of the Phyfeter macrocephalus, or fpermaceti whale; and there mixed with the beaks of the Sepia octopodia, which is the principal food of that whale. He therefore defines ambergrife to be the preternaturally hardened dung or fæces of the Phyfeter macrocephalus, mixed with fome indigeftible relics of its food.

The ufe of ambergrife in Europe is now nearly confined to perfumery, though it has formerly been recommended in medicine by feveral eminent phyficians. Hence the Effentia Ambræ Hoffmanni, Tinctura Regia Cod. Parifini, Trochifci de Ambra Ph. Wurtemberg, &c.

If we wifh to fee any medicinal effects from this fubftance, the Doctor obferves, we muft certainly not expect them from two or three grains, but give rather as many fcruples of it for a dofe: though even then, he thinks, there would not be reafon to expect much effect from it, as he had himfelf taken of pure unadulterated ambergrife in powder 30 grains at once, without obferving the leaft fenfible effect from it. A failor, however, who had the curiofity to try the effect of recent ambergrife upon himfelf, took half an ounce of it melted upon the fire, and found it a good purgative; which proves that it is not quite an inert fubftance.

In Afia and part of Africa ambergrife is not only ufed as a medicine and as a perfume; but confiderable ufe is alfo made of it in cookery, by adding it to feveral difhes as a fpice. A great quantity of it is alfo conftantly bought by the pilgrims who travel to Mecca; probably to offer it there, and make ufe of it in fumigations, in the fame manner as frankincenfe is ufed in Catholic countries. The Turks make ufe of it as an aphrodifiac. Our perfumers add it to fcented pillars, candles, balls or bottles, gloves, and hair-powder; and its effence is mixed with pomatums for the face and hands, either alone or mixed with mufk, &c. tho' its fmell is to fome perfons extremely offenfive.

Ambergrife may be known to be genuine by its fragrant fcent when a hot needle or pin is thruft into it, and its melting like fat of an uniform confiftence; whereas the counterfeit will not yield fuch a fmell, nor prove of fuch a fat texture.—One thing, however, is very remarkable, that this drug, which is the moft fweet of all the perfumes, fhould be capable of being refembled in fmell by a preparation of one of the moft odious of all ftinks. Mr Homberg found, that a veffel in which he had made a long digeftion of the human fæces, acquired a very ftrong and perfect fmell of ambergrife, infomuch that any one would have thought a great quantity of effence of ambergrife had been made in it. The perfume was fo ftrong and offenfive, that the veffel was forced to be removed out of the elaboratory.

AMBERT

AMBERT, a ſmall town of France, in Lower Auvergne, the chief place of a ſmall territory called *Livradois*. It is remarkable for its paper manufactory and camblets. E. Long. 3. 35. N. Lat. 45. 28.

AMBETTUWAY, in botany, a barbarous name of a tree, the leaves of which, when boiled in wine, are ſaid to create an appetite, and is uſed by the people in Guinea with that intention.

AMBIANI, or AMBIANENSIS CIVITAS, now *Amiens*, a city of Picardy. It is called *Samarobriva* by Cæſar and Cicero; which, according to Valeſius, ſignifies the bridge of the *Samara* or *Somme*. *Ambiani* is a later name, taken from that of the people, after the uſual manner of the lower age.

AMBIDEXTER, a perſon who can uſe both hands with the ſame facility, and for the ſame purpoſes, that the generality of people do their right hands.—As to the natural cauſe of this faculty, ſome, as Hœfer, attribute it to an extraordinary ſupply of blood and ſpirits from the heart and brain, which furniſh both hands with the neceſſary ſtrength and agility: others, as Nicholas Maſſa, to an erect ſituation of the heart, inclining neither to the right hand nor left; and others to the right and left ſubclavian arteries being of the ſame height and the ſame diſtance from the heart, by which the blood is propelled with equal force to both hands.—But theſe are only conjectures, or rather chimeras. Many think, that, were it not for education and habit, all mankind would be ambidexters; and in fact, we frequently find nurſes obliged to be at a good deal of pains before they can bring children to forego the uſe of their left hands. How far it may be an advantage to be deprived of half our natural dexterity, may be doubted. It is certain, there are infinite occaſions in life, when it would be better to have the equal uſe of both hands. Surgeons and oculiſts are of neceſſity obliged to be ambidexters; bleeding, &c. in the left-arm or left-ancle, and operations on the left-eye, cannot be well performed but with the left-hand.—Various inſtances occur in hiſtory, where the left-hand has been exerciſed preferably to the right. But by the laws of the ancient Scythians, people were enjoined to exerciſe both hands alike; and Plato enjoins ambidexterity to be obſerved and encouraged in his republic.

AMBIDEXTER, among Engliſh lawyers, a juror or embracer, who accepts money of both parties, for giving his verdict; an offence for which he is liable to be impriſoned, for ever excluded from a jury, and to pay ten times the ſum he accepted of.

AMBIENT, a term uſed for ſuch bodies, eſpecially fluids, as encompaſs others on all ſides: thus, the air is frequently called an ambient fluid, becauſe it is diffuſed round the earth.

AMBIGENÆ OVES, in the heathen ſacrifices, an appellation given to ſuch ewes as, having brought forth twins, were ſacrificed together with their two lambs, one on each ſide. We find them mentioned among other ſacrifices to Juno.

AMBIGENAL HYPERBOLA, a name given by Sir Iſaac Newton to one of the triple hyperbolas of the ſecond order, having one of its infinite legs falling within an angle formed by the aſſymptotes, and the other without.

AMBIGUITY, a defect of language, whereby words are rendered ambiguous. See the next article.

AMBIGUOUS, a term applied to a word or expreſſion which may be taken in different ſenſes.—An anonymous writer has publiſhed a dictionary of ambiguous words: *Lexicon Philoſophicum de Ambiguitate Vocabulorum*, Francof. 1597. 4to.—The reſponſes of the ancient oracles were always ambiguous.

AMBIT, in geometry, is the ſame with what is otherwiſe called the perimeter of a figure. See PERIMETER.

AMBIT was particularly uſed, in antiquity, to denote a ſpace of ground to be left vacant betwixt one building and another. By the laws of the twelve tables, houſes were not to be built contiguous, but an ambit or ſpace of $2\frac{1}{2}$ feet was to be left about each for fear of fire.—The ambitus of a tomb or monument denoted a certain number of feet, in length and breadth, around the ſame, within which the ſanctity aſſigned to it was limited. The whole ground wherein a tomb was erected was not to be ſecreted from the common uſes; for this reaſon, it was frequent to inſcribe the ambit on it, that it might be known how far its ſanctity extended: thus, *in fronte pedes tot, in agrum pedes tot.*

AMBITION (*ambitio*), is generally uſed in a bad ſenſe, for an immoderate or illegal purſuit of power.

In the ſtrict meaning, however, of the word, it ſignifies the ſame with the *ambitus* of the Romans. See the next article.

Ambition, in the former and more uſual ſenſe, is one of thoſe paſſions that is never to be ſatisfied. It ſwells gradually with ſucceſs, and every acquiſition ſerves but as a ſpur to further attempts.

"If a man (it has been well obſerved), could at once accompliſh all his deſires, he would be a miſerable creature; for the chief pleaſure of this life is to wiſh and deſire. Upon this account, every prince who aſpires to be deſpotic aſpires to die of wearineſs. Searching every kingdom for the man who has the leaſt comfort in life, Where is he to be found?—In the royal palace.—What! his majeſty? Yes; eſpecially if he be deſpotic."

AMBITUS, in Roman antiquity, the ſetting up for ſome magiſtracy or office, and formally going round the city to ſolicit the intereſt and votes of the people.

Ambitus differed from *ambition*, as the former lies in the act, the latter in the mind.

Ambitus was of two kinds; one lawful, the other infamous. The firſt, called alſo *ambitus popularis*, was when a perſon offered his ſervice to the republic frankly, leaving it to every body to judge of his pretenſions as they found reaſonable. The means and inſtruments here made uſe of were various. 1. *Amici*, or friends, under different relations, including *cognati, affines, neceſſarii, familiares, vicini, tribules, clientes, municipes, ſodales, collegæ*. 2. *Nomenclatura*, or the calling and ſaluting every perſon by his name; to which purpoſe, the candidates were attended with an officer, under the denomination of *interpres*, or *nomenclator*. 3. *Blanditia*; or obliging perſons, by ſerving them, or their friends, patrons, or the like, with their vote and intereſt on other occaſions. 4. *Prenſatio*; the ſhaking every perſon by the hand, offering him his ſervice, friendſhip,

friendſhip, &c.—The ſecond kind was that wherein force, cajoling, money, or other extraordinary influence, was made uſe of. This was held infamous, and ſeverely puniſhed, as a ſource of corruption and other miſchiefs.

Ambitus was practiſed not only at Rome and in the forum, but in the meetings and aſſemblies of other towns in Italy, where numbers of citizens were uſually found, on account of trade and buſineſs.—The practice ceaſed in the city from the time of the emperors, by reaſon poſts were not then to be had by courting the people, but by favour from the prince.

Perſons who had cauſes depending practiſed the ſame, going about among the judges to implore their favour and mercy. They who practiſed this were called *Ambitioſi*. Hence we alſo meet with *ambitioſa decreta*, and *ambitioſa juſſa*, uſed for ſuch ſentences and decrees as were thus procured from the judges, contrary to reaſon and equity, either gratuitouſly or for money.

AMBLE, in horſemanſhip, a peculiar pace by which a horſe's two legs of the ſame ſide move at the ſame time. See HORSEMANSHIP.

AMBLESIDE, a town in Weſtmoreland, ſeated at one end of Winandermeer, W. long. 0. 49. N. lat. 54. 30.

AMBLETEUSE, a ſea-port town of France, in Picardy, defended with a battery of cannon. E. long. 1. 30. N. lat. 49. 40.

AMBLYGON, in geometry, denotes an obtuſe-angled triangle, or a triangle one of whoſe angles conſiſts of more than 90 degrees.

AMBLYOPY, among phyſicians, ſignifies an obſcuration of the ſight, ſo that objects at a diſtance cannot be clearly diſtinguiſhed.

AMBO, or AMBON, a kind of pulpit or deſk, in the ancient churches, where the prieſts and deacons ſtood to read or ſing part of the ſervice, and preach to the people; called alſo *Analogium*. The term is derived from ἀναβαίνειν, "to mount."—The ambo was mounted upon two ſides; whence ſome alſo derive the appellation from the Latin *ambo*, "both."

The ambo was aſcended by ſteps; which occaſioned that part of the office performed there to be called the *Gradual*. See GRADUAL.

Beſides the goſpel, which was read at the top of the ambo, and the epiſtle, which was read a ſtep lower, they likewiſe publiſhed from this place the acts of the martyrs, the commemoration of departed ſaints, and the letters of peace and communion ſent by one church to another: here, too, converts made a public profeſſion of their faith; and biſhops, their defence, when accuſed: treaties alſo were ſometimes concluded, and the coronations of emperors and kings performed, in the ſame place.

The modern reading-deſks and pulpits have been generally ſubſtituted to the ancient Ambos; though, in ſome churches, remains of the ambos are ſtill ſeen. In that of St John de Lateran at Rome, there are two moveable ambos.

AMBOHITSMENE, or VOHITSANGHOMBE, a province of the iſland of Madagaſcar, ſo called from ſome red mountains of the ſame name, lying in S. Lat. 20°. Theſe mountains are very high, reſembling the Tafelberg of the Cape of Good Hope. On one ſide of this ridge the ſea extends into the country for fifteen leagues; on the other is a flat country abounding in ponds and marſhes. Here is alſo a lake fifteen leagues in length, and the ſame in breadth, containing many ſmall iſlands. The inhabitants of the mountains are called *Zaferahongs*; and have plenty of gold, iron, cattle, ſilk, &c.

AMBOISE, a town of France, in Touraine, ſeated at the confluence of the rivers Loire and Maſſee. The town is mean and ill built; but has been rendered famous in hiſtory by the conſpiracy of the Proteſtants in 1560, which opened the fatal wars of religion in France. The caſtle is ſituated on a craggy rock, extremely difficult of acceſs, and the ſides of which are almoſt perpendicular. At its foot flows the Loire, which is divided into two ſtreams by a ſmall iſland. To this fortreſs the duke of Guiſe, when he expected an inſurrection among the Hugonots, removed Francis II. as to a place of perfect ſecurity. Only two detached parts of the ancient caſtle now remain, one of which was conſtructed by Charles VIII. and the other by Francis I. The former of thoſe princes was born and died at Amboiſe. The town is ſituated E. Long. 1. 30. N. Lat. 47. 25.

AMBOULE, a province of Madagaſcar, ſomewhat to the northward of S. Lat. 23°. It is a fertile and agreeable country, watered by the river Manampani, whoſe mouth lies in S. Lat. 23. 30. The country produces plants and fruits in plenty. Iron mines are alſo found here. The black cattle are extremely fat, and their fleſh excellent. In this province ſtands a large town of the ſame name; near which is a fountain of hot water, within 20 feet of a ſmall river whoſe ſand is almoſt burning. The water of the fountain is ſaid to boil an egg hard in two hours; and the inhabitants affirm it to be a ſovereign remedy againſt the gout. The people here are employed in different preparations of iron and ſteel, which they have from their own mines, and forge ſeveral inſtruments with tolerable ſkill. Their governor is honoured with the title of *Rabertau*, or *Great Lord*. He exerciſes ſovereign authority and abſolute power; but is frequently, in times of diſtreſs, ſurpriſed by his ſubjects, who aſſemble in great numbers, ſeize his perſon, and threaten him with death unleſs they are relieved. To extricate himſelf from this dilemma, he is inſtantly obliged to iſſue orders for diſtributing proviſions among them; but is uſually repaid with intereſt, a quadruple return being made in a plentiful harveſt. The people of Amboule live in great licentiouſneſs with their ſuperiors, and their country is generally a retreat for the roguiſh and lazy.

AMBOYNA, one of the Molucca iſlands, in the Eaſt Indies. It lies in S. Lat. 3. 36. and E. Long. 126. 20. and is remarkable for being the centre of the commerce for nutmegs and cloves, which is entirely monopolized by the Dutch Eaſt-India company. It is about 24 leagues in circumference. Beſides cloves, it likewiſe abounds in moſt of the tropical fruits and fiſh; nor is there here any deficiency of good water; but fleſh is very ſcarce. This ſcarcity, however, proceeds more from the policy of the Dutch than either the intemperature of the climate or the barrenneſs of the ſoil: For, excepting cloves, they have in Amboy-

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Amboyna. na, as well as the Moluccas, induſtriouſly diſcouraged the cultivation of every eſculent commodity, with the view of with-holding ſubſiſtence from thoſe who might be tempted to invade them.

Of the natives, the men wear large whiſkers, but leave little hair upon their chin; and have only a ſlight piece of ſtuff wrapped round their middle. The women tie their hair in knots: the maids are bought of their fathers before they are married; and if the wife proves barren, the marriage is diſſolved. Some of the natives are Mahometans, and ſome Chriſtians: but they are all ſaid to be lazy, deceitful, and treacherous. They make war with ſmall ſwift veſſels, in ſhape like dragons with regard to the head and tail. Their houſes are built of bamboo-canes and ſago-trees. They ſleep on mats. Their weapons are bows and arrows, javelins, ſcymitars, and targets.

Amboyna was firſt diſcovered by the Portugueſe, who built a fort upon it, which was taken from them by the Dutch in 1605. They did not, however, become maſters of the whole iſland at once. The Engliſh had here five factories, which lived under the protection of the Dutch caſtle; holding themſelves ſafe, in reſpect of the friendſhip between the two nations. Great differences had ariſen between the Dutch and Engliſh coloniſts in this part of the world; till at laſt, the Engliſh Eaſt-India company applying to king James, a treaty was concluded in 1619, by which the concerns both of the Engliſh and Dutch were regulated, and certain meaſures agreed upon for preventing future diſputes. This was an additional ſecurity to the Engliſh; and, by virtue of the treaty, they continued two years in Amboyna, trading with the Dutch. During this time, however, ſeveral diſputes happened; which occaſioning mutual diſcontents, the complaints were ſent to Jaccatra, in the iſland of Java Major, to the council of defence of both nations there reſiding: but they not agreeing, a ſtate of the matter was ſent over to Europe, to be decided by the Eaſt-India companies of both nations; or, in caſe they could not agree, by the King of England and the States of Holland, according to an article in the treaty of 1619.— But before theſe diſputes could be decided in a legal way, the Dutch, in order to give the more ſpecious colouring to the violent ſeizure which they meditated of the iſland of Amboyna, made uſe of the ſtale pretext of a conſpiracy being formed by the Engliſh and Japaneſe to diſpoſſeſs them of one of their forts in this place. The plot, it was alleged, had been confeſſed by a Japaneſe and Portugueſe in the Engliſh ſervice, who were moſt inhumanly tortured till they ſhould anſwer in the affirmative ſuch interrogatories as might favour the ſecret deſign of thoſe cruel inquiſitors. Upon the injurious evidence of this conſtrained declaration, they immediately accuſed the Engliſh factors of the pretended conſpiracy. Some of them they impriſoned, and others they loaded with irons and ſent on board their ſhips; ſeizing at the ſame time all the Engliſh merchandize, with their writings and books.

Theſe acts of violence were followed by a ſcene of horror unexampled in the puniſhment of the moſt atrocious offenders. Some of the factors they tortured, by compelling them to ſwallow water till their bodies were diſtended to the utmoſt pitch; then taking the miſerable victims down from the boards to which they had been faſtened, and cauſing them to diſgorge the water; if they did not acknowledge the imputed guilt, the proceſs of torture was repeated. Others of the Engliſh they conſumed by burning them gradually from the feet upwards, in order to extort the confeſſion of a conſpiracy, which was only pretended by the infernal policy of thoſe ſavage tormentors. Some had the nails of the fingers and toes torn off; and in ſome they made holes in their breaſts, filling the cavities with inflammable materials, to which they afterwards put fire. Thoſe who did not expire under the agonies of torture were conſigned to the hands of the executioner. Amboyna.

The allegation of this pretended conſpiracy was equally void of probability and truth. The Dutch had a garriſon of 300 men in the fort, beſides the burghers in the town, and ſeveral other forts and garriſons in the iſland, while the number of the Engliſh did not amount to 20 men; nor were even thoſe provided with arms or ammunition to effect ſuch a deſign as that with which they were charged. There likewiſe was not one Engliſh veſſel in the harbour, whereas the Dutch had eight ſhips riding near the town: neither, when the Dutch broke open the deſks and trunks of the factors, was there found a ſingle paper or letter which could be conſtrued into the moſt diſtant relation to any conſpiracy. Add to all this, that ſuch of the unhappy ſufferers as could ſpeak to be heard, declared in the moſt ſolemn manner their innocence of the plot with which they were charged.

The whole of the tranſaction affords the moſt irrefragable teſtimony that it was founded entirely upon a political fiction of the Hollanders, who had themſelves formed the deſign of monopolizing the trade of the Spice Iſlands; for the accompliſhment of which they perpetrated, about the ſame time, a ſimilar tragedy at Pooleron, where they put to the torture 162 of the natives, whom they likewiſe charged with a pretended conſpiracy. It may juſtly be reckoned ſingular in the fortune of this commercial republic, that they have ever ſince been permitted to enjoy in peace thoſe invaluable iſlands, which were originally obtained by ſuch atrocious infringements of humanity and the laws of nations as will ſtain the Dutch annals, to the lateſt ages, with indelible infamy.

The more effectually to preſerve this trade, the Dutch have had all the clove-trees in the adjacent iſlands grubbed up. Sometimes alſo, when the harveſt is very large, part of the produce of Amboyna itſelf is burnt. —To prevent the rearing of cloves in any of the neighbouring iſlands, or the inhabitants from ſelling them to ſtrangers, the governor of Amboyna makes the tour of his government with a fleet of curricurries, conſiſting ſometimes of 20, and at others of 30, 40, or 50 ſail. This expedition is made with all the pomp imaginable, in order to gratify the pride and folly of the Indian chiefs. The true reaſon of their taking all this pains is, becauſe experience has ſhown, that no contracts, however ſolemn, can prevent the inhabitants of thoſe iſlands from ſelling their ſpice to ſtrangers; and even now, frauds are ſo frequently practiſed by the Dutch themſelves, though the company is inexorable in puniſhing them, that the common people call the cloves *galken-kruid*, that is, the gallows-ſpice.

Beſides the cloves, coffee is alſo cultivated here by the

Ambracia. the Dutch, and a gold mine has been lately found out. This was difcovered by the quantities of gold-duft that were wafhed from fome mountains by the torrents. Here alfo grow feveral kinds of valuable wood, of which they make tables, chairs, efcritoirs, &c. for the principal perfons in the government; and the reft is fold all over the Indies at a very extravagant rate.

Amboyna is divided into two parts, viz. a greater and leffer peninfula. The former, called *Hiton*, is 12 leagues in length, and two and a half broad. In this the Dutch have no lefs than five forts, or rather ftrong redoubts, mounted with cannon. The other is called *Leytimor*, five leagues in length, and one and a half broad, which is the fouthern part of the ifland; on this ftands the fort of Victoria, which is the refidence of the governor, and his council, compofed of 15 gentlemen or merchants. The fortrefs is a fquare, the ramparts mounted with 60 pieces of brafs cannon, and the garrifon ufually compofed of 600 men. It is fo ftrong by nature and art, as to be in a manner impregnable; and fo effectually does it command the harbour, that no veffel could come in or go out without being funk by the cannon, if the governor chofe. The inhabitants of Amboyna are computed at 70 or 80,000, of whom but a fmall number are Dutch; and this obliges the latter to be continually upon their guard, and to keep a competent number of troops in each of their forts, particularly in that of Middleburgh, which ftands upon the ifthmus that connects thefe peninfulas. There are alfo redoubts and garrifons in all the iflands of this government.

AMBRACIA, one of the moft confiderable cities of ancient Epirus, fituated on the river Aracthus, at a fmall diftance from the fea. At firft it was a free city; but was afterwards reduced by the Æacidæ kings of Epirus, who chofe it for the place of their refidence. In procefs of time, the Ætolians made themfelves mafters of it, and held it till the year before Chrift 189, when it fell into the hands of the Romans.

At this time Ambracia was a place of great ftrength. It was defended on one fide by the river Aracthus, and on the other by fteep and craggy hills; and furrounded with an high and thick wall, above three miles in compafs. The Roman conful Fluvius began the fiege by forming two camps, feparated by the river, but with a communication between them; the Romans were pofted in one, and the Epirots their allies in the other. He then threw up two lines, one of circumvallation, and the other of contravallation; and built a wooden tower, in form of a caftle, over againft the citadel, which ftood on a hill. The Ætolians, however, before the lines were quite finifhed, found means to throw about 1000 men into the place.

The lines being completed, the city was attacked in five different places at once. The battering-rams fhook the walls on all fides; and the Romans, from their moveable towers, pulled down the battlements with a kind of fythes which they faftened to long beams. The befieged made a vigorous defence. They were night and day on the walls, and indefatigable in preventing the effects of the rams and fythes. The ftrokes of the former they deadened, by letting down beams, large ftones, lumps of lead, &c. by means of pullies, upon them when they were in motion; the others they rendered ufelefs, by pulling the beams to which they were faftened into the city with hooks contrived for the purpofe. Ambracia.

While Fluvius was carrying on the fiege, Nicander the Ætolian prætor found means to throw 500 men into the city, under the command of one Nicodamus, with whom Nicander agreed to attack the Roman camp in the night-time; not doubting, that, if the garrifon from within, and the army from without, fell upon them at the fame time, they would be obliged to raife the fiege. Nicodamus narrowly watched the time at which he was ordered to fally; and, though Nicander did not appear, marched out at the head of the garrifon, armed with fire-brands and torches. The Roman centinels, furprifed at this fight, ran to wake the legionaries, and foon fpread a general alarm all over the camp. The legionaries marched in fmall bodies as they happened to meet, to repulfe the enemy, whom they engaged in three different places. Two parties of the garrifon were driven back: but the third, commanded by two Ætolian generals, made a great flaughter of the Romans; and, not finding themfelves feconded by Nicander, retired in good order into the city.

Though the befieged were thus abandoned, and had no hopes of affiftance, they continued to defend themfelves with incredible vigour and refolution. The Romans had no fooner made a breach in the wall, but it was repaired, and a new one built behind it. The conful, therefore, altered his meafures; and, inftead of making breaches with the ram, began to undermine the wall, in hopes of throwing down great part of it at once, and entering the city before the befieged could have time to build a new wall. The miners being covered, were not obferved by the garrifon, till the great quantities of earth brought out of the mine gave the alarm. The Ætolians immediately began to countermine; and having dug a trench of the depth they fuppofed the mine to be, they carried it along the wall where they heard the ftrokes of the pick-axes of the Romans. When the two mines met, a battle enfued, firft with pick-axes and fpades, and then with fwords and fpears: but this attack did not laft long, each party making themfelves a kind of rampart with the loofe earth. The Ætolians, in order to drive their enemies quite out of the mine, invented a machine, which they brought to the place where the two mines met: this was an hollow veffel with an iron bottom, bored through in many places, and armed with fpikes at proper diftances to prevent the enemy from approaching it: this veffel they filled with feathers, which they fet on fire, and with bellows driving the fmoke on the befiegers, obliged them to leave the mine, half-fuffocated. This interval the Ætolians made ufe of in repairing the foundations of the wall.

The vigorous refiftance made by the Ambracians, however, did not raife the courage of the nation in general, who were determined on a peace with Rome at all events. Fluvius, in the mean time, being defirous of getting poffeffion of Ambracia before the conclufion of the peace, employed Amynander, king of the Athamanes, to perfuade the inhabitants to furrender. As Amynander had great intereft in Ambracia, having long refided there, he eafily perfuaded them to capitulate on the following terms, viz. That the Ætolian garrifon fhould have leave to march out of the city; that the inhabitants

inhabitants ſhould pay 500 talents, 200 down, and the reſt at ſix equal payments; and that they ſhould deliver to the conſul all the priſoners and deſerters that were in the city. The gates were then opened to Fluvius; and he was preſented with a crown of gold, together with many fine ſtatues and pictures, of which there were great numbers in the city, it having been the capital of Pyrrhus, who had enriched it with many valuable monuments.

From this time the city of Ambracia made no figure in hiſtory. It is ſcarce known at preſent where the city ſtood; but that called *Arba*, in upper Albania, ſeems beſt to agree with what is ſaid of the ancient ſituation of this city. The river Aracthus, on which Ambracia was ſituated, is now called, by the natives, *Spagmagmuriſi*.

AMBREADA, thus they call the falſe or factitious amber, which the Europeans uſe in their trade with the negroes on the coaſt of Africa, and particularly on the river Senegal. There are ſome large and red pieces of it, a thouſand of which making twenty ropes or ſtrings, weigh three pounds. There are others ſmall, and alſo red, which weigh but two pounds and a half.

AMBRESBERRY, a market-town in Wiltſhire, about ſix miles north of Saliſbury, and ſituated in W. Long. 1. 40. and N. Lat. 51. 20.

AMBRONES, a Gauliſh people who lived near the foot of the Alps, between Switzerland and Provence. They invaded the Roman territories in conjunction with the Cimbri and Teutones; but were defeated with great ſlaughter by Marius, about 101 years before Chriſt. Their women, who had ſtaid during the engagement in a kind of fortification made with their carts, on ſeeing their huſbands flying, and the Romans at their heels, armed themſelves with axes, and, gnaſhing with their teeth, fell with fury on the purſuers and the purſued. Their firſt rage being ſpent, they deſired to ſurrender themſelves, upon the ſingle condition, that their chaſtity ſhould not be violated; but this equitable requeſt being denied, they firſt killed their children, and then themſelves, not one remaining alive out of the whole multitude.

AMBROSE-ISLAND, a ſmall iſland laid down in ſome of the moſt approved charts, and particularly mentioned in Mr Robertſon's Elements of Navigation, as lying in S. Lat. 25. 30. W. Long. 82. 20. It was ſearched for, however, in 1767, by Captain Carteret, with ſuch diligence, that he concludes it to have no exiſtence, as he could not diſcover land any where near that place.

AMBROSE (St), biſhop of Milan, one of the moſt eminent fathers of the fourth century, born in Gaul in the year 333, according to Dr Cave, or in 340, as Mr Du Pin affirms. His father was at this time *præfectus prætorio* in Gaul; and reſided at Arles, the capital of Gallia Narbonenſis. The birth of Ambroſe is ſaid to have been followed with a remarkable preſage of his future eloquence; for we are told, that a ſwarm of bees came and ſettled upon his mouth as he lay in his cradle. He ſoon made himſelf maſter of the ſeveral parts of ſecular learning; and pleaded cauſes before Probus with ſo much eloquence, that he was appointed his aſſeſſor, and ſoon after governor of the provinces of Liguria and Æmilia. He ſettled at Milan; where, in the year 374, upon the death of Auxentius biſhop of that city, there being a great conteſt between the Catholics and Arians concerning the choice of a new biſhop, Ambroſe thought it his duty, as governor, to go to the church, in order to compoſe the tumult. He accordingly addreſſed himſelf to the people in a gentle pathetic ſpeech, exhorting them to proceed to their choice in a calm and friendly manner: while he was ſpeaking to them, the whole aſſembly cried out with one voice, "Let Ambroſe be biſhop!" Such a ſudden and unexpected incident ſurpriſed him extremely; ſo that he retired immediately, and uſed every method to divert them from their reſolution of chooſing him: but at laſt he was obliged to comply; and was baptiſed (being but a catechumen before), and ordained biſhop, towards the latter end of the year 374, or beginning of 375. About the year 377, the barbarous nations making an incurſion into the Roman empire, he fled to Illyricum, and afterwards to Rome. In the year 384, he was ſent to the tyrant Maximus, who had uſurped the empire, and prevailed upon him not to paſs over into Italy. The heathens being encouraged by theſe inteſtine commotions in the empire, attempted to reſtore their religion, and employed Q. Aurelius Symmachus, perfect of Rome, a man of great eloquence, to plead their cauſe. This gave riſe to the famous conteſt between St Ambroſe and him, about repairing the altar of Victory. But Symmachus having loſt his cauſe, was expelled the city, and commanded not to approach within an hundred miles of it. The petition which he preſented to the emperor Valentinian the younger, is ſtill extant; we find in it the ſtrongeſt figures of rhetoric and the greateſt force of eloquence. St Ambroſe wrote a confutation of this petition; but he has been thought guilty of many paralogiſms: and yet he proteſts, "that he endeavoured only after the ſolidity of reaſoning, leaving Symmachus all the glory of eloquence and politeneſs; it being (ſays he) the peculiar privilege of the pagan philoſophers to amuſe the mind with colours as falſe as their idols; and to ſay great things, not being capable of ſaying true ones." Ambroſe met with a good deal of oppoſition from the Arians, againſt whom he acted with great ſpirit and intrepidity. Juſtina the empreſs and mother of Valentinian, who was an Arian, reſolving to reſtore Arianiſm at Milan, began with demanding of St Ambroſe one of the churches, which was called the Portian church: but he refuſed it; and the people ſurrounding the palace in a body, ſhe was obliged to leave him in poſſeſſion of his church, and even deſire him to pacify the people.

Ambroſe was a ſecond time ſent to the tyrant Maximus, for Valentinian found no perſon ſo proper to negotiate with him. He ſpoke to him with great courage and boldneſs, but could obtain nothing; for Maximus ſoon after marched into Italy, and made himſelf maſter of the weſtern empire: ſo that Valentinian was obliged to retire, with his mother Juſtina and his ſiſter Galla, to Theſſalonica in Illyricum, in order to deſire Theodoſius's aſſiſtance; who defeated Maximus, and reſtored Valentinian to the empire.

While Theodoſius continued in Italy, after the defeat of Maximus, an inſurrection happened at Theſſalonica, in which ſeveral of the magiſtrates were ſtoned, and their bodies dragged along the ſtreets. Theodoſius being informed of this, raſhly commanded a certain number of the inhabitants to be put to death promiſcuouſly;

cuously; by which means the city was filled with the blood of many innocent perfons, and amongft the reft feveral ftrangers who were but juft come there: no regard was had to any diftinction of perfons, no form of trial was obferved; but they were cut down like corn in the harveft, as Theodoret expreffes it, to the number of 7000. At this time an affembly of bifhops was held at Milan, who all expreffed an abhorrence of fuch cruelty in the emperor. Ambrofe wrote a letter to him, in which he reprefented the enormity of his crime, and exhorted him to make fatisfaction by a fincere fubmiffion and repentance. Some time after, Theodofius coming to Milan, went to receive the facrament at the great church; where Ambrofe meeting him at the door, denied him entrance, and reprefented his guilt in the moft forcible and pathetic terms. The emperor was ftruck with his words, and with great uneafinefs of mind returned to his palace; but about a year after, Ambrofe, being convinced of the fincerity of his repentance, admitted him into the church.

In 392, Valentinian the emperor being affaffinated by the contrivance of Argobaftes, and Eugenius ufurping the empire, Ambrofe was obliged to leave Milan; but he returned the year following, when Eugenius was defeated. He died at Milan the 4th of April 397; being 57 years of age, according to Mr Du Pin and fome other writers; but Dr Cave and Olearius fay that he was 64 years old at his death. He was buried in the great church at Milan. He wrote feveral works, the moft confiderable of which is that *De Officiis*. He is concife and fententious in his manner of writing, and full of turns of wit; his terms are well chofen, and his expreffions noble; he diverfifies his fubject by an admirable copioufnefs of thought and language; he is very ingenious in giving an eafy and natural turn to every thing which he treats of, and is not without ftrength and pathos when there is occafion for it. This is part of the character which Du Pin gives him as a writer; but Erafmus obferves that he has many quaint and affected fentences, and frequently very obfcure ones; and it is certain that his writings are intermixed with many ftrange and peculiar opinions. Paulinus wrote his life, and dedicated it to St Auguftin: this life is prefixed to St Ambrofe's works; the beft edition of which is reckoned to be that publifhed by the Benedictine monks, in two volumes in folio, at Paris, in 1686 and 1690.

Ambrose (Ifaac), an eminent prefbyterian minifter, was educated at Brazen-nofe college Oxford, where he took the degree of bachelor of arts, and became minifter of Prefton, and afterwards of Garftang in Lancafhire, where he was in 1662 ejected for non-conformity. It was ufual with him to retire every year for a month into a little hut in a wood; where he fhunned all fociety, and devoted himfelf to religious contemplation. Dr Calamy obferves, that he had a very ftrong impulfe on his mind of the approach of death, and took a formal leave of his friends at their houfe a little before his departure; and the laft night of his life he fent his difcourfe concerning *angels* to the prefs. The next day he fhut himfelf up in his parlour, where, to the great furprife and regret of all who faw him, he was found juft expiring. He died in 1663-4, in the 72d year of his age. He wrote feveral other books; as the *Prima, Media, et Ultima*, or the Firft, Middle, and Laft Things; War with devils; Looking unto Jefus; &c.

Ambrose, or *St* Ambrose *in the Wood*, an order of religious, who ufe the Ambrofian office, and wear an image of that faint engraven on a little plate: in other refpects, they conform to the rule of the Auguftins. See Ambrosian *Office*, and Augustins.

AMBROSIA, in heathen antiquity, denotes the folid food of the gods, in contradiftinction from the drink, which was called *nectar*. It had the appellation *ambrofia* (compounded of the particle α, and βροτος, *immortal*,) as being fuppofed to render thofe immortal who fed on it.

Ambrosia is alfo a fplendid kind of title, given by fome phyficians to certain alexipharmic compofitions, of extraordinary virtue. The name was particularly given to a famous antidote of Philip of Macedon, againft all poifons, bites, and ftings of venomous creatures, as well as many internal difeafes.

Ambrosia: A genus of the pentandria order, belonging to the monœcia clafs of plants; and, in the natural method, ranking under the 49th order, *Compofitæ-nucamentaceæ*. The characters are:—The Male flowers are compound: The common *calyx* is a fingle-leav'd perianthium, the length of the florets: The compound *corolla* is uniform, tubular, flat, and hemifpherical; the proper is monopetalous, funnel-fhaped, and quinquefid: The *ftamina* confift of five very fmall filaments; the antheræ are erect, parallel, and pointed: The *piftillum* has a filiform ftylus, the length of the ftamina; the ftigma orbicular and membranous: The *receptaculum* is naked.—Female flowers below the male ones, on the fame plant, doubled: The *calyx* is a fingle-leav'd perianthium, entire (with the belly quinquedentated), one-flowered, and perfiftent: There is no *corolla*: The *piftillum* has an ovate germen in the bottom of the calyx; a filiform ftylus, the length of the calyx; and two long briftly ftigmata: The *pericarpium* is an ovate unilocular nut: The *feed* is fingle and roundifh. Of this genus five fpecies are enumerated; but having no properties worthy of notice, we omit any farther account of them.

AMBROSIAN office, or rite, in church-hiftory, a particular formula of worfhip in the church of Milan, which takes its name from St Ambrofe, who inftituted that office in the fourth century. Each church originally had its particular office; and when the Pope, in after-times, took upon him to impofe the Roman office upon all the weftern churches, that of Milan fheltered itfelf under the name and authority of St Ambrofe; from which time the Ambrofian ritual has prevailed.

AMBROSIN, in middle-age writers, denotes a coin ftruck by the lords or dukes of Milan, whereon was reprefented St Ambrofe on horfeback, with a whip in his right hand. The occafion of this coinage is faid to have been a vifion of that faint, who appeared to the Milanefe general in 1339, during the time of a battle.

AMBROSINIA, in botany; a genus of the polyandria order belonging to the gynandria clafs of plants; the characters of which are: The *calyx* is a fingle-leaved fpatha, divided by a partition into two cells: There is no *corolla*: The *ftamina* confift of a fingle filament in the interior cell; the antheræ are numerous,

numerous, with two roundiſh concave nectaries at their baſe: The *piſtillum* is in the interior cell; the germen roundiſh; the ſtylus cylindrical, and ſhorter than the ſpatha; the ſtigma obtuſe: The *pericarpium* (a capſule?) roundiſh and unilocular. There is but one ſpecies, a native of Turkey.

AMBROSIUS AURELIANUS, or AURELIUS AMBROSIUS, a famous general of the ancient Britons, of Roman extraction. He was educated at the court of Aldroen of Amorica; who, at the requeſt of the Britons, ſent him over with ten thouſand men, to aſſiſt them againſt the Saxons, whom Vortigern had invited into Britain. Ambroſius had ſuch ſucceſs againſt the Saxons, that the Britons choſe him for their king, and compelled Vortigern to give up to him all the weſtern part of the kingdom divided by the Roman highway called *Watling-ſtreet*. Some time after, the Britons being diſcontented with Vortigern, and having withdrawn their allegiance from him, he returned to a caſtle in Wales, where being beſieged by Ambroſius, and the caſtle taking fire, he periſhed in the flames, and left his rival ſole monarch of Britain; who now took upon him the imperial purple, after the manner of the Roman emperors. Geoffrey of Monmouth tells us, that Ambroſius built Stonehenge near Saliſbury in Wiltſhire. Ambroſius, according to this hiſtorian, coming to a monaſtery near Caercaradoc, now Saliſbury, where three hundred Britiſh lords, maſſacred by Hengiſt, lay buried, and reſolving to perpetuate the memory of this action, he ordered his workmen to prepare a large quantity of ſtones and other materials. But having, at the inſtigation of Tremounus archbiſhop of Caerleon, conſulted the famous Merlin, this magician adviſed him to ſend over to Ireland for certain great ſtones, called *chorea gigantum*, the giant's dance, placed in a circle on a hill called *Killair*, having been brought thither by giants from the fartheſt borders of Africa. A body of forces were accordingly ſent into Ireland, under Pendragon, Ambroſius's brother, to fetch theſe ſtones; but were oppoſed in their attempt by Gilliomanus king of the country, who derided the folly of the Britons in undertaking ſo ridiculous an expedition. Nevertheleſs, the Britons having vanquiſhed this prince in battle, brought away the ſtones; and by the direction and aſſiſtance of Merlin, who had accompanied them, theſe wonderful ſtones, by order of Ambroſius, were placed over the graves of the Britiſh lords, and are now what is called *Stonehenge*. Alexander Mecham celebrates this fable in his poem *De divinæ ſapientiæ laudibus*. Polydore Virgil aſſigns another origin of Stonehenge: he tells us it was erected by the Britons as a monument to their general Ambroſius, on the place where he fell in battle, to perpetuate the memory of his glorious actions and ſervices done to his country. Both theſe ſtories are rejected by our beſt antiquaries; who, however, are by no means agreed as to the true origin of this famous piece of antiquity. See STONEHENGE.

After the Britons had defeated the Saxons, and obliged them to retire northward, Ambroſius is ſaid to have convened the princes and great men at York, where he gave orders for repairing the churches deſtroyed by the Saxons, and reſtoring the exerciſe of religion to its former luſtre. This is confirmed by Matthew of Weſtminſter; who highly applauds the great zeal of Ambroſius in repairing the churches, encouraging the clergy, and reſtoring the honour of religion. The Monmouth hiſtorian gives this prince a very high character. "He was a man (ſays he) of ſuch bravery and courage, that when he was in Gaul no one durſt enter the liſts with him; for he was ſure to unhorſe his antagoniſt, or to break his ſpear into ſhivers. He was, moreover, generous in beſtowing, careful in performing religious duties, moderate in all things, and more eſpecially abhorred a lie. He was ſtrong on foot, ſtronger on horſeback, and perfectly qualified to command an army." The ſame author tells us he was poiſoned at Wincheſter by one Eopa a Saxon, diſguiſed as a phyſician, and hired for that purpoſe by Paſcentius one of the ſons of Vortigern: but the generally received opinion is, that he was killed in a battle which he loſt in the year 508, againſt Cerdric, one of the Saxon generals.

AMBRY, a place in which are depoſited all utenſils neceſſary for houſe-keeping. In the ancient abbeys and priories, there was an office under this denomination, wherein were laid up all charities for the poor.

AMBUBAJÆ, in Roman antiquity, were immodeſt women, who came from Syria to Rome, where they lived by proſtitution, and by playing on the flute: the word is derived from the Syriac *abub*, which ſignifies a flute; altho' others make it to come from *am* and *Baiæ*, becauſe theſe proſtitutes often retired to Baiæ. According to Cruquius, theſe women uſed likewiſe to ſell paint for ornamenting the face, &c.

AMBULANT, or AMBULATORY. They give in France the name of *ambulant commiſſioners* to thoſe commiſſioners, or clerks of the king's farms, who have no ſettled office; but viſit all the offices within a certain diſtrict, to ſee that nothing be done in them againſt the king's right and the intereſt of the farm.

AMBULANT is alſo uſed to denote thoſe brokers at Amſterdam, or exchange agents, who have not been ſworn before the magiſtrates. They tranſact brokerage buſineſs, but their teſtimony is not received in the courts of juſtice.

AMBULATORY, a term anciently applied to ſuch courts, &c. as were not fixed to any certain place; but held ſometimes in one place, and ſometimes in another. In oppoſition to ſtationary courts.—The court of parliament was anciently ambulatory; ſo alſo were the courts of king's bench, &c.

AMBURBIUM, in Roman antiquity, a proceſſion made by the Romans round the city and pomœrium, in which they led a victim, and afterwards ſacrificed it, in order to avert ſome calamity that threatened the city.

AMBURY, or ANBURY, among ferriers, denotes a tumor, wart, or ſwelling, which is ſoft to the touch, and full of blood.

This diſorder of horſes is cured by tying a horſe-hair very hard about its root; and, when it has fallen off, which commonly happens in about eight days, ſtrewing ſome powder of verdigris upon the part, to prevent the return of the complaint. If the tumor be ſo low that nothing can be tied about it, they cut it out with a knife, or elſe burn it off with a ſharp hot iron; and, in ſinewy parts, where a hot iron is improper, they eat it away with oil of vitriol, or white ſublimate.

Many of our farriers boast of a secret which infallibly cures all kinds of protuberances of this kind; the preparation of which is this: Take three ounces of green vitriol and one ounce of white arsenic; beat them to a coarse powder, and put them into a crucible; place the crucible in the midst of a charcoal fire, stirring the substance, but carefully avoiding the poisonous steams; when the whole grows reddish, take the crucible out of the fire, and, when cool, break it and take out the matter at the bottom; beat this to powder in a mortar, and add to four ounces of this powder five ounces of *album rhosis*; make the whole into an ointment, and let it be applied cold to warts; rubbing them with it every day. They will by this means fall off gently and easily, without leaving any swellings. It is best to keep the horse quiet, and without working, during the cure. What sores remain on the parts which the swellings fall off from, may be cured with the common application called the *countess's ointment*.

AMBUSCADE, or AMBUSH, in the military art, properly denotes a place where soldiers may lie concealed till they find an opportunity to surprise the enemy.

In the language of Scripture, these terms are not always taken in their proper signification, for laying ambushes for any one, attacking him in secret, laying snares for him. They sometimes signify no more than attacking a man who has no distrust of such a thing; attacking one behind, concealing one's self in some particular place in order to surprise any one. See the book of Judes, ch. ix. 25, 32, 34, 35. Abimelech, who lay lurking with his people in the heights of Sichem, so, however, as to rob and treat those who passed that way very ill, came and attacked the city of Sichem with his troops divided into three bodies: *Tetendit insidias juxta Sichimam in quatuor locis.* Literally, according to the Hebrew, "They prepared ambuscades against Sichem in four heads or companies." And a little farther, verse 43. "Abimelech being informed that the Sichemites were marched, took his army and divided it into three bodies, and laid wait for them in the field." It seems certain, that in these passages ambushes, properly so called, were not the things in question. In the first book of Samuel, Saul complains that David laid ambuscades for him: *Insidiator usque hodie permanens.* Now nothing could be worse grounded than this accusation, if we understand the word *insidiari* in its proper signification; but he might say, though unjustly, that David was his secret enemy. And in the Chronicles it is said, that God turned the ambushes laid by the enemies of Israel upon themselves; that is to say, their endeavours, their malice, their arms, he turned against themselves: for the enemies there mentioned came not in private or by stratagem; they marched openly in arms against Israel.

AMBY, a town of the Austrian Netherlands, in the province of Limburg, situated opposite to Maestricht, on the east side of the river Maese, in E. Long. 5. 45. N. Lat. 50. 57.

AMEDIANS, in church-history, a congregation of religious in Italy, so called from their professing themselves *amantes Deum*, "lovers of God;" or rather *amati Deo*, "beloved of God." They wore a grey habit and wooden shoes, had no breeches, and girt themselves with a cord. They had 28 convents; and were united by Pope Pius V. partly with the Cistercian order, and partly with that of the Soccolanti, or wooden-shoe wearers.

AMELIA, an episcopal city of Italy, in the state of the church, seated on a mountain, in the duchy of Spoletto. E. Long. 13. 20. N. Lat. 42. 33.

AMELLUS, STARWORT: A genus of the polygamia superflua order, belonging to the syngenesia class of plants; and in the natural method ranking under the 49th order, *Compositæ-oppositifoliæ*. The characters are: The common *calyx* is imbricated and roundish: The *compound corolla* is radiated; the hermaphrodite corollets numerous in the disk; the female numerous in the ray: *Proper* corolla of the hermaphrodites are tubular and quinquefid; of the females, tongued, loose, and two or three toothed: The *stamina* in the hermaphrodites consist of five short capillary filaments; the anthera cylindric and tubular: The *pistillum* has an ovate germen; a filiform stylus the length of the stamina; and two filiform stigmata: There is no *pericarpium*, but the calyx unchanged: The *seeds* are ovate and solitary; the *pappus* is hairy; the *receptaculum* chaffy.—Of this there are two

Species. 1. The lynchitis, with one flower on each footstalk. This is a native of the Cape of Good Hope. It is a perennial plant, rising about three feet high, sending out many branches on each side, so as to form a bushy plant; the branches are garnished with obtuse spear-shaped leaves placed opposite, and are terminated by single naked flower-stalks, each supporting one violet-coloured flower, having a yellow disk, which is succeeded by oblong seeds. 2. The umbellatus, with flowers growing in umbels, is a native of Jamaica; and rises from two to three feet high, sending out many branches cloathed with opposite leaves, which are terminated by small flowers in umbels.

Culture. The first is easily propagated, either by cuttings planted in the summer-months, or by seeds sown on a moderate hot-bed in the spring, but the plants require a slight shelter in winter. The second is much more tender, and therefore requires to be preserved in a stove during the winter season.

AMELOT DE LA HOUSSAI (Nicholas), born at Orleans in 1634, was much esteemed at the court of France, and appointed secretary of an embassy which that court sent to the commonwealth of Venice, as appears by the title of his translation of Father Paul's History of the Council of Trent; but he afterwards published writings which gave such offence, that he was imprisoned in the Bastile. The first works he printed were the History of the Government of Venice, and that of the Uscocks, a people of Croatia. In 1683 he published his translations into French of Machiavel's Prince, and Father Paul's History of the Council of Trent, and Political Discourses of his own upon Tacitus. These performances were well received by the public. He did not prefix his own name to the two last mentioned works, but concealed himself under that of La Mothe Josseval. His translation of Father Paul was attacked by the partisans of the pope's unbounded power and authority. In France, however, it met with great success; all the advocates for the liberty of the Gallican church promoting the success of it to the utmost of their power, though at the same time there were three memorials

presented to have it suppressed. When the second edition of this translation was published, it was violently attacked by the Abbé St Real, in a letter he wrote to Mr Bayle, dated October 17. 1685. Amelot defended himself, in a letter to the same gentleman. In 1684, he printed at Paris a French translation of Baltasar Gracian's *Oraculo manual*, with the title of *l'Homme de Cour*. In 1686, he printed *La Morale de Tacite de la flaterie;* in which work he collected several particular facts and maxims, which represent in a strong light the artifices of court-flatterers, and the mischievous effect of their poisonous discourses. Frederick Leonard, a bookseller at Paris, having proposed, in the year 1692, to print a collection of all the treaties of peace between the kings of France and all the other princes of Europe, since the reign of Charles VII. to the year 1690, Amelot published a small volume in duodecimo, containing a preliminary discourse upon these treatises; wherein he endeavours to show, that most princes, when they enter into a treaty, think more how to evade than how to perform the terms they subscribe to. He published also an edition of Cardinal d'Ossat's Letters in 1697, with several observations of his own; which, as he tells us in his advertisement, may serve as a supplement to the history of the reigns of Henry III. and Henry IV. kings of France. He wrote several other works; and died at Paris in 1706, being then almost 73 years of age.

AMELOT (Denis), a celebrated French writer, was born at Saintonge in 1606. He maintained a close correspondence with the fathers of the Oratory, a congregation of priests founded by Philip of Neri. He wrote the life of Charles de Gondren, second superior of this congregation, and published it at Paris in 1643. In this piece he said something of the famous Abbot of St Cyran, which greatly displeased the gentlemen of Port Royal; who, to be revenged of him, published a libel against him, intitled *Idée generale l'esprit et de livre de P. Amelote*. He was so much provoked by this satire, that he did all in his power to injure them. They had finished a translation of the New Testament, and were desirous to have it published; for which purpose they endeavoured to procure an approbation from the doctors of the Sorbonne, and a privilege from the king. But Amelot, by his influence with the Chancellor, prevented them from succeeding. In this he had also a view to his own interest; for he was about to publish a translation of his own of the New Testament. Amelot's translation with annotations, in 4 vols octavo, was printed in the years 1666, 1667, and 1668. It is not very exact, according to F. Simon, who tells us that it contains some very gross blunders. Amelot wrote also an Abridgment of Divinity, a Catechism for the Jubilee, and a kind of Christian Manual for every Day. Towards the end of his life, he entered into the congregation of the Oratory in 1650; and continued amongst them till his death, which happened in 1678.

AMEN, אמן, signifies *true, faithful, certain.* It is made use of likewise to affirm any thing, and was a sort of affirmation used often by our Saviour: Αμην, Αμην, λεγω υμιν, i. e. *Verily, verily, I say unto you.* Lastly, it is understood as expressing a wish; as *Amen, So be it*, Numb. v. 22. or an affirmation, *Amen, yes, I believe it*, 1 Cor. xiv. 16. The Hebrews and the five books of Psalms, according to their way of distributing them, with the words *amen, amen;* which the Septuagint have translated γενοιτο, γενοιτο; and the Latins *fiat, fiat*. The Greek and Latin churches have preserved this word in their prayers, as well as *alleluiah* and *hosanna;* because they observed more energy in them than in any terms which they could use in their own languages. At the conclusion of the public prayers, the people answered with a loud voice, Amen; and St Jerom says, that at Rome when the people answered Amen, the sound of their voices was like a clap of thunder: *In similitudinem cælestis tonitrui Amen reboat.* The Jews assert that the gates of heaven are opened to him who answers *Amen* with all his might.

AMEND, or AMENDE, in the French customs, a pecuniary punishment imposed by a judge for any crime, false prosecution, or groundless appeal.

AMENDE Honourable, an infamous kind of punishment inflicted in France upon traitors, parricides, or sacrilegious persons, in the following manner: The offender being delivered into the hands of the hangman, his shirt is stripped off, a rope put about his neck, and a taper in his hand; then he is led into court, where he must beg pardon of God, the king, the court, and his country. Sometimes the punishment ends here; but sometimes it is only a prelude to death, or banishment to the galleys.

AMENDE Honourable, is a term also used for making recantation in open court, or in presence of the person injured.

AMENDMENT, in a general sense, denotes some alteration or change made in a thing for the better.

AMENDMENT, in law, the correction of an error committed in a process, which may be amended after judgement, unless the error lies in giving judgment; for in that case it is not amendable, but the party must bring a writ of error. A bill may be amended on the file at any time before the plea is pleaded; but not afterwards, without motion and leave of the court.

AMENDMENT of a Bill, in parliament, is some alteration made in the first draught of it.

AMENTUM, in botany, the name of a species of calyx, consisting of valves, and hanging down in different directions from the caulis. Common oats afford a good example of the amentum.

AMENTUM, in Roman antiquity, a thong tied about the middle of a javelin or dart, and fastened to the fore-finger, in order to recover the weapon as soon as it was discharged. The ancients made great use of the amentum, thinking it helped to enforce the blow. It also denotes a latchet that bound their sandals.

AMERADE, a kind of officers among the Saracens, answering to the governors of provinces among the Europeans.—The name is originally the same with that of emir.

AMERCEMENT, or AMERCIAMENT, in law, a pecuniary punishment imposed on offenders at the mercy of the court. It differs from a fine in being imposed arbitrarily in proportion to the fault; whereas a fine is a certain punishment settled expresly by some statute.

AMERICA (from *Americus Vesputius*, falsely said to be the first discoverer of the continent); one of the

America.

four quarters of the world, probably the largest of the whole, and from its late discovery frequently denominated the *New World*.

1 Boundaries.

This vast country extends from the 80th degree of north, to the 56th degree of south latitude; and, where its breadth is known, from the 35th to the 136th degree west longitude from London; stretching between 8000 and 9000 miles in length, and in its greatest breadth 3690. It sees both hemispheres, has two summers and a double winter, and enjoys all the variety of climates which the earth affords. It is washed by the two great oceans. To the eastward it has the Atlantic, which divides it from Europe and Africa; to the west it has the Pacific or Great South Sea, by which it is separated from Asia. By these seas it may, and does, carry on a direct commerce with the other three parts of the world.

2 North and South continent.

America is not of equal breadth throughout its whole extent; but is divided into two great continents, called *North* and *South America*, by an isthmus 1500 miles long, and which at Darien, about Lat. 9° N. is only 60 miles over. This isthmus forms, with the northern and southern continents, a vast gulph, in which lie a great number of islands, called the *West Indies*, in contradistinction to the eastern parts of Asia, which are called the *East Indies*.

3 Remarkable prevalence of cold.

Between the New World and the Old, there are several very striking differences; but the most remarkable is the general predominance of cold throughout the whole extent of America. Though we cannot, in any country, determine the precise degree of heat merely by the distance of the equator, because the elevation above the sea, the nature of the soil, &c. affect the climate; yet, in the ancient continent, the heat is much more in proportion to the vicinity to the equator than in any part of America. Here the rigour of the frigid zone extends over half that which should be temperate by its position. Even in those latitudes where the winter is scarcely felt on the Old continent, it reigns with great severity in America, though during a short period. Nor does this cold, prevalent in the New World, confine itself to the temperate zones; but extends its influence to the torrid zone also, considerably mitigating the excess of its heat.—Along the eastern coast, the climate, though more similar to that of the torrid zone in other parts of the earth, is nevertheless considerably milder than in those countries of Asia and Africa which lie in the same latitude. From the southern tropic to the extremity of the American continent, the cold is said to be much greater than in parallel northern latitudes even of America itself.

For this so remarkable difference between the climate of the New continent and the Old, various causes have been assigned by different authors. The following is the opinion of the learned Dr Robertson on this subject.

4 Dr Robertson's reasons for this superior degree of cold. *History of America*, vol. I. p. 253.

"Though the utmost extent of America towards the north be not yet discovered, we know that it advances nearer to the pole than either Europe or Asia. The latter have large seas to the north, which are open during part of the year; and, even when covered with ice, the wind that blows over them is less intensely cold than that which blows over land in the same latitudes. But, in America, the land stretches from the river St Lawrence towards the pole, and spreads out immensely to the west. A chain of enormous mountains, covered with snow and ice, runs through all this dreary region. The wind passing over such an extent of high and frozen land, becomes so impregnated with cold, that it acquires a piercing keenness, which it retains in its progress through warmer climates; and is not entirely mitigated until it reach the gulph of Mexico. Over all the continent of North America, a north-westerly wind and excessive cold are synonymous terms. Even in the most sultry weather, the moment that the wind veers to that quarter, its penetrating influence is felt in a transition from heat to cold no less violent than sudden. To this powerful cause we may ascribe the extraordinary dominion of cold, and its violent inroads into the southern provinces in that part of the globe.

"Other causes, no less remarkable, diminish the active power of heat in those parts of the American continent which lie between the tropics. In all that portion of the globe, the wind blows in an invariable direction from east to west. As this wind holds its course across the ancient continent, it arrives at the countries which stretch along the western shore of Africa, inflamed with all the fiery particles which it hath collected from the sultry plains of Asia, and the burning sands in the African desarts. The coast of Africa is accordingly the region of the earth which feels the most fervent heat, and is exposed to the unmitigated ardour of the torrid zone. But this same wind, which brings such an accession of warmth to the countries lying between the river of Senegal and Cafraria, traverses the Atlantic ocean before it reaches the American shore. It is cooled in its passage over this vast body of water; and is felt as a refreshing gale along the coasts of Brasil and Guiana, rendering those countries, tho' amongst the warmest in America, temperate, when compared with those which lie opposite to them in Africa. As this wind advances in its course across America, it meets with immense plains covered with impenetrable forests; or occupied by large rivers, marshes, and stagnating waters, where it can recover no considerable degree of heat. At length it arrives at the Andes, which run from north to south thro' the whole continent. In passing over their elevated and frozen summits, it is so thoroughly cooled, that the greater part of the countries beyond them hardly feel the ardour to which they seem exposed by their situation. In the other provinces of America, from Terra Firma westward to the Mexican empire, the heat of the climate is tempered, in some places, by the elevation of the land above the sea; in others, by their extraordinary humidity; and in all, by the enormous mountains scattered over this tract. The islands of America in the torrid zone are either small or mountainous, and are fanned alternately by refreshing sea and land breezes.

"The causes of the extraordinary cold towards the southern limits of America, and in the seas beyond it, cannot be ascertained in a manner equally satisfying. It was long supposed, that a vast continent, distinguished by the name of *Terra Australis Incognita*, lay between the southern extremity of America and the antarctic pole. The same principles which account for the extraordinary degree of cold in the northern regions of America, were employed in order to explain that which is felt at Cape Horn and the adjacent countries. The immense extent of the southern continent, and the

America.

5 rivers

Plate XII.

A. Bell Sculp.

Plate XIII.

S. America
PACIFIC
OCEAN
OR GREAT
SOUTH
SEA
NORTH SEA
ATLANTIC
OCEAN
THE
SOUTHERN
OCEAN
NEW SPAIN
TERRA FIRMA
AMAZONS
PERU
BRASIL
PARA
GUAY
CHILI
TERRA MAGEL LANICA
Pampas
Tropic of Capricorn
Equinoctial Line
R. of Amazons
Rio de la Plata
Str. of Magellen
C. Horn
Land seen by an Englishman in 1636
Port discovered by Sir Fra. Drake
Cape Verd Is.
Ascension I.
Longitude from London

America. rivers which it poured into the ocean, were mentioned and admitted by philosophers as causes sufficient to occasion the unusual sensation of cold, and the still more uncommon appearances of frozen seas in that region of the globe. But the imaginary continent to which such influence was ascribed having been searched for in vain, and the space which it was supposed to occupy having been found to be an open sea; new conjectures must be formed with respect to the causes of a temperature of climate, so extremely different from that which we experience in countries removed at the same distance from the opposite pole.

Ibid. p. 451. note xxxi. "The most obvious and probable cause of this superior degree of cold towards the southern extremity of America, seems to be the form of the continent there. Its breadth gradually decreases as it stretches from St Antonio southwards, and from the bay of St Julian to the straits of Magellan its dimensions are much contracted. On the east and west sides, it is washed by the Atlantic and Pacific oceans. From its southern point, it is probable that an open sea stretches to the antarctic pole. In whichever of these directions the wind blows, it is cooled before it approaches the Magellanic regions, by passing over a vast body of water; nor is the land there of such extent, that it can recover any considerable degree of heat in its progress over it. These circumstances concur in rendering the temperature of the air in this district of America, more similar to that of an insular, than to that of a continental climate; and hinder it from acquiring the same degree of summer-heat, with places in Europe and Asia, in a corresponding northern latitude. The north wind is the only one that reaches this part of America, after blowing over a great continent. But, from an attentive survey of its position, this will be found to have a tendency rather to diminish than augment the degree of heat. The southern extremity of America is properly the termination of the immense ridge of the Andes, which stretches nearly in a direct line from north to south, through the whole extent of the continent. The most sultry regions in South America, Guiana, Brasil, Paraguay, and Tucuman, lie many degrees to the east of the Magellanic regions. The level country of Peru, which enjoys the tropical heats, is situated considerably to the west of them. The north wind, then, though it blows over land, does not bring to the southern extremity of America an increase of heat collected in its passage over torrid regions; but, before it arrives there, it must have swept along the summit of the Andes, and come impregnated with the cold of that frozen region."

5
Extreme moisture of the American climate.

Another particularity in the climate of America is its excessive moisture in general. In some places, indeed, on the western coast, rain is not known; but, in all other parts, the moistness of the climate is as remarkable as the cold.—The forests wherewith it is every where covered, no doubt, partly occasion the moisture of its climate; but the most prevalent cause is the vast quantity of water in the Atlantic and Pacific Oceans, with which America is environed on all sides. Hence those places where the continent is narrowest are deluged with almost perpetual rains, accompanied with violent thunder and lightning, by which some of them, particularly Porto Bello, are rendered in a manner uninhabitable.

6
Large rivers, and excessive luxuriance of vegetation.

This extreme moisture of the American climate is productive of much larger rivers there than in any other part of the world. The Danube, the Nile, the Indus, or the Ganges, are not comparable to the Missisippi, the River St Laurence, or that of the Amazons; nor are such large lakes to be found any where as those which North America affords.—To the same cause we are also partly to ascribe the excessive luxuriance of all kinds of vegetables in almost all parts of this country. In the southern provinces, where the moisture of the climate is aided by the warmth of the sun, the woods are almost impervious, and the surface of the ground is hid from the eye, under a thick covering of shrubs, herbs, and weeds.—In the northern provinces, the forests are not encumbered with the same luxuriance of vegetation; nevertheless, they afford trees much larger of their kind than what are to be found any where else.

7
Malignity of climate unjustly ascribed to America.

From the coldness and the moisture of America, an extreme malignity of climate has been inferred, and asserted by M. de Paw in his *Recherches Philosophiques*. Hence, according to his hypothesis, the smallness and irregularity of the nobler animals, and the size and enormous multiplication of reptiles and insects.

History of Mexico, vol. II. p. 255.

But the supposed smallness and less ferocity of the American animals, the Abbé Clavigero observes, instead of the malignity, demonstrates the mildness and bounty of the clime, if we give credit to Buffon, at whose fountain M. de Paw has drank, and of whose testimony he has availed himself against Don Pernetty. Buffon, who in many places of his Natural History produces the smallness of the American animals as a certain argument of the malignity of the climate of America; in treating afterwards of savage animals, in Tom. II. speaks thus: "As all things, even the most free creatures, are subject to natural laws, and animals as well as men are subjected to the influence of climate and soil, it appears that the same causes which have civilized and polished the human species in our climates, may have likewise produced similar effects upon other species. The wolf, which is perhaps the fiercest of all the quadrupeds of the temperate zone, is however incomparably less terrible than the tyger, the lion, and the panther of the torrid zone; and the white bear and hyena of the frigid zone. In America, where the air and the earth are more mild than those of Africa, the tyger, the lion, and the panther, are not terrible but in the name. They have degenerated, if fierceness, joined to cruelty, made their nature; or, to speak more properly, they have only suffered the influence of the climate: under a milder sky their nature also has become more mild. From climes which are immoderate in their temperature are obtained drugs, perfumes, poisons, and all those plants whose qualities are strong. The temperate earth, on the contary, produces only things which are temperate; the mildest herbs, the most wholesome pulse, the sweetest fruits, the most quiet animals, and the most humane men, are the natives of this happy clime. As the earth makes the plants, the earth and plants make animals; the earth, the plants, and the animals make man. The physical qualities of man, and the animals which feed on other animals, depend, though more remotely, on the same causes which influence their dispositions and customs. This is the greatest proof and demonstration, that in temperate climes every thing becomes temperate, and that in intemperate

America.

temperate climes every thing is excessive; and that size and form, which appear fixed and determinate qualities, depend notwithstanding, like the relative qualities, on the influence of climate. The size of our quadrupeds cannot be compared with that of an elephant, the rhinoceros, or sea-horse. The largest of our birds are but small if compared with the ostrich, the condore, and *casoare*." So far M. Buffon, whose text we have copied, because it is contrary to what M. de Paw writes against the climate of America, and to Buffon himself in many other places.

If the large and fierce animals are natives of intemperate climes, and small and tranquil animals of temperate climes, as M. Buffon has here established; if mildness of climate influences the disposition and customs of animals, M. de Paw does not well deduce the malignity of the climate of America from the smaller size and less fierceness of its animals; he ought rather to have deduced the gentleness and sweetness of its climate from this antecedent. If, on the contrary, the smaller size and less fierceness of the American animals, with respect to those of the old continent, are a proof of their degeneracy, arising from the malignity of the clime, as M. de Paw would have it, we ought in like manner to argue the malignity of the climate of Europe from the smaller size and less fierceness of its animals, compared with those of Africa. If a philosopher of the country of Guinea should undertake a work in imitation of M. de Paw, with this title, *Recherches Philosophiques sur les Europeens*, he might avail himself of the same argument which M. de Paw uses, to demonstrate the malignity of the climate of Europe, and the advantages of that of Africa. The climate of Europe, he would say, is very unfavourable to the production of quadrupeds, which are found incomparably smaller, and more cowardly, than ours. What are the horse and the ox, the largest of its animals, compared with our elephants, our rhinoceroses, our sea-horses, and our camels? What are its lizards, either in size or intrepidity, compared with our crocodiles? Its wolves, its bears, the most dreadful of its wild beasts, when beside our lions and tygers? Its eagles, its vultures, and cranes, if compared with our ostriches, appear only like hens.

8
America not more infested than other countries with insects and noxious animals.

As to the enormous size and prodigious multiplication of the insects and other little noxious animals, "The surface of the earth (says M. de Paw), infected by putrefaction, was over-run with lizards, serpents, reptiles, and insects monstrous for size, and the activity of their poison, which they drew from the copious juices of this uncultivated soil, that was corrupted and abandoned to itself, where the nutritive juice became sharp, like the milk in the breast of animals which do not exercise the virtue of propagation. Caterpillars, crabs, butterflies, beetles, spiders, frogs, and toads, were for the most part of an enormous corpulence in their species, and multiplied beyond what can be imagined. Panama is infested with serpents, Carthagena with clouds of enormous bats, Portobello with toads, Surinam with *kakerlacas* or *cucarachas*, Guadaloupe, and the other colonies of the islands, with beetles, Quito with niguas or chegoes, and Lima with lice and bugs. The ancient kings of Mexico, and the emperors of Peru, found no other means of ridding their subjects of those insects which fed upon them, than the imposition of an annual tribute of a certain quantity of lice. Ferdinand Cortes found bags full of them in the palace of Montezuma." But this argument, exaggerated as it is, proves nothing against the climate of America in general, much less against that of Mexico. There being some lands in America, in which, on account of their heat, humidity, or want of inhabitants, large insects are found, and excessively multiplied, will prove at most, that in some places the surface of the earth is infected, as he says, with putrefaction; but not that the soil of Mexico, or that of all America, is stinking, uncultivated, vitiated, and abandoned to itself. If such a deduction were just, M. de Paw might also say, that the soil of the old continent is barren, and stinks; as in many countries of it there are prodigious multitudes of monstrous insects, noxious reptiles, and vile animals, as in the Philippine Isles, in many of those of the Indian archipelago, in several countries of the south of Asia, in many of Africa, and even in some of Europe. The Philippine Isles are infested with enormous ants and monstrous butterflies; Japan with scorpions; South of Asia and Africa with serpents; Egypt with asps; Guinea and Ethiopia with armies of ants; Holland with field-rats; Ukrania with toads, as M. de Paw himself affirms. In Italy, the Campagna di Roma (although peopled for so many ages), with vipers; Calabria with tarantulas; the shores of the Adriatic sea with clouds of gnats; and even in France, the population of which is so great and so ancient, whose lands are so well cultivated, and whose climate is so celebrated by the French, there appeared, a few years ago, according to M. Buffon, a new species of field-mice, larger than the common kind, called by him *Surmulots*, which have multiplied exceedingly, to the great damage of the fields. M. Bazin, in his Compendium of the History of Insects, numbers 77 species of bugs, which are all found in Paris and its neighbourhood. That large capital, as Mr Bomare says, swarms with those disgustful insects. It is true that there are places in America, where the multitude of insects, and filthy vermin, make life irksome; but we do not know that they have arrived to such excess of multiplication as to depopulate any place, at least there cannot be so many examples produced of this cause of depopulation in the new as in the old continent, which are attested by Theophrastus, Varro, Pliny, and other authors. The frogs depopulated one place in Gaul, and the locusts another in Africa. One of the Cyclades was depopulated by mice; Amiclas, near to Taracina, by serpents; another place, near to Ethiopia, by scorpions and poisonous ants; and another by scolopendras; and not so distant from our own times, the Mauritius was going to have been abandoned on account of the extraordinary multiplication of rats, as we can remember to have read in a French author.

With respect to the size of the insects, reptiles, and such animals, M. de Paw makes use of the testimony of Mr Dumont, who, in his Memoirs on Louisiana, says, that the frogs are so large there that they weigh 37 French pounds, and their horrid croaking imitates the bellowing of cows. But M. de Paw himself says (in his answer to Don Pernetty, cap. 17.), that all those who have written about Louisiana from Henepin, Le Clerc, and Cav. Tonti, to Dumont, have contradicted each other, sometimes on one and sometimes on another

America. ther subject. In fact, neither in the old or the new continent are there frogs of 37 pounds in weight; but there are in Asia and Africa serpents, butterflies, ants, and other animals of such monstrous size, that they exceed all those which have been discovered in the new world. We know very well, that some American historian says, that a certain gigantic species of serpents is to be found in the woods, which attract men with their breath, and swallow them up; but we know also that several historians, both ancient and modern, report the same thing of the serpents of Asia, and even something more. Megasthenes, cited by Pliny, said, that there were serpents found in Asia, so large, that they swallowed entire stags and bulls. Metrodorus, cited by the same author, affirms, that in Asia there were serpents which, by their breath, attracted birds, however high they were, or quick their flight. Among the moderns, Gemelli, in Vol. V. of his Tour of the World, when he treats of the animals of the Philippine isles, speaks thus: "There are serpents in these islands of immoderate size; there is one called *Ibitin*, very long, which suspending itself by the tail from the trunk of a tree, waits till stags, bears, and also men pass by, in order to attract them with its breath, and devour them at once entirely:" from whence it is evident, that this very ancient fable has been common to both continents.

Further, it may be asked, In what country of America could M. de Paw find ants to equal those of the Philippine islands, called *Sulum*, respecting which Hernandez affirms, that they are six fingers broad in length and one in breadth? Who has ever seen in America butterflies so large as those of Bourbon, Ternate, the Philippine isles, and all the Indian archipelago? The largest bat of America (native to hot shady countries), which is that called by Buffon *Vampiro*, is, according to him, of the size of a pigeon. *La Rougette*, one of the species of Asia, is as large as a raven; and the *Roussette*, another species of Asia, is as big as a large hen. Its wings, when extended, measure from tip to tip three Parisian feet, and according to Gemelli, who measured it in the Philippine isles, six palms. M. Buffon acknowledges the excess in size of the Asiatic bat over the American species, but denies it as to number. Gemelli says, that those of the island of Luzon were so numerous that they darkened the air, and that the noise which they made with their teeth, in eating the fruits of the woods, was heard at the distance of two miles. M. de Paw says, in talking of serpents, "it cannot be affirmed that the new world has shown any serpents larger than those which Mr Adanson saw in the deserts of Africa." The greatest serpent found in Mexico, after a diligent search made by Hernandez, was 18 feet long: but this is not to be compared with that of the Moluccas, which Bomare says is 33 feet in length; nor with the *Anacandaja* of Ceylon, which the same author says is more than 33 feet long: nor with others of Asia and Africa, mentioned by the same author. Lastly, the argument drawn from the multitude and size of the American insects is fully as weighty as the argument drawn from the smallness and scarcity of quadrupeds, and both detect the same ignorance, or rather the same voluntary and studied forgetfulness, of the things of the old continent.

With respect to what M. de Paw has said of the tribute of lice in Mexico, in that as well as in many other things he discovers his ridiculous credulity. It is true that Cortes found bags of lice in the magazines of the palace of king Axajacatl. It is also true, that Montezuma imposed such a tribute, not on all his subjects however, but only on those who were beggars; not on account of the extraordinary multitude of those insects, as M. de Paw affirms, but because Montezuma, who could not suffer idleness in his subjects, resolved that that miserable set of people, who could not labour, should at least be occupied in lousing themselves. This was the true reason of such an extravagant tribute, as Torquemada, Betancourt, and other historians relate; and nobody ever before thought of that which M. de Paw affirms, merely because it suited his preposterous system. Those disgusting insects possibly abound as much in the hair and cloaths of American beggars, as of any poor and uncleanly low people in the world: but there is not a doubt, that if any sovereign of Europe was to exact such a tribute from the poor in his dominions, not only bags, but great vessels might be filled with them.

9 General description of the natives.

At the time America was discovered, it was found inhabited by a race of men no less different from those in the other parts of the world, than the climate and natural productions of this continent are different from those of Europe, Asia, or Africa.—One great peculiarity in the native Americans is their colour, and the indentity of it throughout the whole extent of the continent. In Europe and Asia, the people who inhabit the northern countries are of a fairer complexion than those who dwell more to the southward. In the torrid zone, both in Africa and Asia, the natives are entirely black, or the next thing to it. This, however, must be understood with some limitation. The people of Lapland, who inhabit the most northerly part of Europe, are by no means so fair as the inhabitants of Britain; nor are the Tartars so fair as the inhabitants of Europe, who lie under the same parallels of latitude. Nevertheless, a Laplander is fair when compared with an Abyssinian, and a Tartar if compared with a native of the Molucca islands.—In America, this distinction of colour was not to be found. In the torrid zone there were no negroes, and in the temperate and frigid zones there were no white people. All of them were of a kind of red copper-colour, which Mr Forster observed, in the Pesserays of Terra del Fuego, to have something of a gloss resembling that metal. It doth not appear, however, that this matter hath ever been inquired into with sufficient accuracy. The inhabitants of the inland parts of South America, where the continent is widest, and consequently the influence of the sun the most powerful, have never been compared with those of Canada, or more northerly parts, at least by any person of credit. Yet this ought to have been done, and that in many instances too, before it could be asserted so positively as most authors do, that there is not the least difference of complexion among the natives of America. Indeed, so many systems have been formed concerning them, that it is very difficult to obtain a true knowledge of the most simple facts.—If we may believe the Abbé Raynal, the Californians are swarthier than the Mexicans; and so positive is he in this opinion, that he gives a reason for it. "This difference of colour," says he, "proves, that the civilized life of society subverts, or totally changes, the order and laws of nature, since we

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we find, under the temperate zone, a ſavage people that are blacker than the civilized nations of the torrid zone."—On the other hand, Dr Robertſon claſſes all the inhabitants of Spaniſh America together with regard to colour, whether they are civilized or uncivilized; and when he ſpeaks of California, takes no notice of any peculiarity in their colour more than others.—The general appearance of the indigenous Americans in various diſtricts is thus deſcribed by the chevalier Pinto: "They are all of a copper colour, with ſome diverſity of ſhade, not in proportion to their diſtance from the Equator, but according to the degree of elevation of the territory in which they reſide. Thoſe who live in a high country are fairer than thoſe in the marſhy low lands on the coaſt. Their face is round; farther removed, perhaps, than that of any people, from an oval ſhape. Their fore-head is ſmall; the extremity of their ears far from the face; their lips thick; their noſe flat; their eyes black, or of a cheſnut colour, ſmall, but capable of diſcerning objects at a great diſtance. Their hair is always thick and ſleek, and without any tendency to curl. At the firſt aſpect, a South-American appears to be mild and innocent; but, on a more attentive view, one diſcovers in his countenance ſomething wild, diſtruſtful, and ſullen."

10 Don Ulloa's account.

The following account of the native Americans is given by Don Antonio Ulloa, in a work intitled *Memoires philoſophiques, hiſtoriques, et phyſiques, concernant la decouverte de l'Amerique*, lately publiſhed.

The American Indians are naturally of a colour bordering upon red. Their frequent expoſure to the ſun and wind changes it to their ordinary duſky hue. The temperature of the air appears to have little or no influence in this reſpect. There is no perceptible difference in complexion between the inhabitants of the high and thoſe of the low parts of Peru; yet the climates are of an extreme difference. Nay, the Indians who live as far as 40 degrees and upwards ſouth or north of the equator, are not to be diſtinguiſhed, in point of colour, from thoſe immediately under it.

There is alſo a general conformation of features and perſon, which, more or leſs, characterizeth them all. Their chief diſtinctions in theſe reſpects are a ſmall forehead, partly covered with hair to the eye-brows, little eyes, the noſe thin, pointed, and bent towards the upper lip; a broad face, large ears, black, thick, and lank hair; the legs well formed, the feet ſmall, the body thick and muſcular; little or no beard on the face, and that little never extending beyond a ſmall part of the chin and upper lip. It may eaſily be ſuppoſed that this general deſcription cannot apply, in all its parts, to every individual; but all of them partake ſo much of it, that they may be eaſily diſtinguiſhed even from the mulattoes, who come neareſt to them in point of colour.

The reſemblance among all the American tribes is not leſs remarkable in reſpect to their genius, character, manners, and particular cuſtoms. The moſt diſtant tribes are, in theſe reſpects, as ſimilar as though they formed but one nation.

All the Indian nations have a peculiar pleaſure in painting their bodies of a red colour, with a certain ſpecies of earth. The mine of Guancavelica was formerly of no other uſe than to ſupply them with this material for dyeing their bodies; and the cinnabar extracted from it was applied entirely to this purpoſe. The tribes in Louiſiana and Canada have the ſame paſſion; hence minium is the commodity moſt in demand there.

America.

It may ſeem ſingular that theſe nations, whoſe natural colour is red, ſhould affect the ſame colour as an artificial ornament. But it may be obſerved, that they do nothing in this reſpect but what correſponds to the practice of Europeans, who alſo ſtudy to heighten and diſplay to advantage the natural red and white of their complexions. The Indians of Peru have now indeed abandoned the cuſtom of painting their bodies: but it was common among them before they were conquered by the Spaniards; and it ſtill remains the cuſtom of all thoſe tribes who have preſerved their liberty. The northern nations of America, beſides the red colour which is predominant, employ alſo black, white, blue, and green, in painting their bodies.

11 Peculiarities in regard to ornament and dreſs.

The adjuſtment of theſe colours is a matter of as great conſideration with the Indians of Louiſiana and the vaſt regions extending to the north, as the ornaments of dreſs among the moſt poliſhed nations. The buſineſs itſelf they call *Mactaher*, and they do not fail to apply all their talents and aſſiduity to accompliſh it in the moſt finiſhed manner. No lady of the greateſt faſhion ever conſulted her mirror with more anxiety, than the Indians do while painting their bodies. The colours are applied with the utmoſt accuracy and addreſs. Upon the eye-lids, preciſely at the root of the eye laſhes, they draw two lines as fine as the ſmalleſt thread; the ſame upon the lips, the openings of the noſtrils, the eyebrows, and the ears; of which laſt they even follow all the inflexions and ſinuoſities. As to the reſt of the face, they diſtribute various figures, in all which the red predominates, and the other colours are aſſorted ſo as to throw it out to the beſt advantage. The neck alſo receives its proper ornaments; a thick coat of vermilion commonly diſtinguiſhes the cheeks. Five or ſix hours are requiſite for accompliſhing all this with the nicety which they affect. As their firſt attempts do not always ſucceed to their wiſh, they efface them, and begin a-new upon a better plan. No coquette is more faſtidious in her choice of ornament, none more vain when the important adjuſtment is finiſhed. Their delight and ſelf-ſatisfaction are then ſo great, that the mirror is hardly ever laid down. An Indian *Mactached* to his mind is the vaineſt of all the human ſpecies. The other parts of the body are left in their natural ſtate, and, excepting what is called a *cachecul*, they go entirely naked.

Such of them as have made themſelves eminent for bravery, or other qualifications, are diſtinguiſhed by figures painted on their bodies. They introduce the colours by making punctures on their ſkin, and the extent of ſurface which this ornament covers is proportioned to the exploits they have performed. Some paint only their arms, others both their arms and legs; others again their thighs, while thoſe who have attained the ſummit of warlike renown, have their bodies painted from the waiſt upwards. This is the heraldry of the Indians; the devices of which are probably more exactly adjuſted to the merits of the perſons who bear them, than thoſe of more civilized countries.

Beſides theſe ornaments, the warriors alſo carry plumes

America. plumes of feathers on their heads, their arms, and ancles. These likewise are tokens of valour, and none but such as have been thus distinguished may wear them.

The propensity to indolence is equal among all the tribes of Indians, civilized or savage. The only employment of those who have preserved their independence is hunting and fishing. In some districts the women exercise a little agriculture, in raising Indian corn and pompions, of which they form a species of aliment, by bruising them together: they also prepare the ordinary beverage in use among them, taking care, at the same time, of the children, of whom the fathers take no charge.

The female Indians of all the conquered regions of South America practise what is called the *urcu* (a word which among them signifies *elevation*). It consists in throwing forward the hair from the crown of the head upon the brow, and cutting it round from the ears to above the eye; so that the forehead and eye-brows are entirely covered. The same custom takes place in the Northern countries. The female inhabitants of both regions tie the rest of their hair behind, so exactly on the same fashion, that it might be supposed the effect of mutual imitation. This however being impossible, from the vast distance that separates them, is thought to countenance the supposition of the whole of America being originally planted with one race of people.

This custom does not take place among the males. Those of the higher parts of Peru wear long and flowing hair, which they reckon a great ornament. In the lower parts of the same country they cut it short, on account of the heat of the climate; a circumstance in which they imitate the Spaniards. The inhabitants of Louisiana pluck out their hair by the root, from the crown of the head forwards, in order to obtain a large forehead, otherwise denied them by nature. The rest of their hair they cut as short as possible, to prevent their enemies from seizing them by it in battle, and also to prevent them from easily getting their scalp, should they fall into their hands as prisoners.

12 Remarkable insensibility to pain,

The whole race of American Indians is distinguished by thickness of skin and hardness of fibres; circumstances which probably contribute to that insensibility to bodily pain for which they are remarkable. An instance of this insensibility occurred in an Indian who was under the necessity of submitting to be cut for the stone. This operation, in ordinary cases, seldom lasts above four or five minutes. Unfavourable circumstances in his case prolonged it to the uncommon period of 27 minutes. Yet all this time the patient gave no tokens of the extreme pain commonly attending this operation: he complained only as a person does who feels some slight uneasiness. At last the stone was extracted. Two days after, he expressed a desire for food, and on the eighth day from the operation he quitted his bed, free from pain, although the wound was not yet thoroughly closed. The same want of sensibility is observed in cases of fractures, wounds, and other accidents of a similar nature. In all these cases their cure is easily effected, and they seem to suffer less present pain than any other race of men. The skulls that have been taken up in their ancient burying-grounds are of a greater thickness than that bone is commonly found, being from six to seven lines from the outer to the inner superficies. The same is remarked as to the thickness of their skins.

It is natural to infer from hence, that their comparative insensibility to pain is owing to a coarser and stronger organization, than that of other nations. The ease with which they endure the severities of climate is another proof of this. The inhabitants of the higher parts of Peru live amidst perpetual frost and snow. 13
Although their clothing is very slight, they support this inclement temperature without the least inconvenience. Habit, it is to be confessed, may contribute a good deal to this, but much also is to be ascribed to the compact texture of their skin, which defends them from the impression of cold through their pores.

And to the inclemencies of weather.

The northern Indians resemble them in this respect. The utmost rigours of the winter season do not prevent them from following the chace almost naked. It is true, they wear a kind of woollen cloak, or sometimes the skin of a wild beast, upon their shoulders; but besides that it covers only a small part of their body, it would appear that they use it rather for ornament than warmth. In fact, they wear it indiscriminately, in the severities of winter and in the sultriest heats of summer, when neither Europeans nor Negroes can suffer any but the slightest cloathing. They even frequently throw aside this cloak when they go a-hunting, that it may not embarrass them in traversing their forests, where they say the thorns and undergrowth would take hold of it; while, on the contrary, they slide smoothly over the surface of their naked bodies. At all times they go with their heads uncovered, without suffering the least inconvenience, either from the cold, or from those *coups de soleil*, which in Louisiana are so often fatal to the inhabitants of other climates.

The Indians of South America distinguish themselves by modern dresses, in which they affect various tastes. Those of the high country, and of the valleys in Peru, dress partly in the Spanish fashion. Instead of hats they wear bonnets of coarse double cloth, the weight of which neither seems to incommode them when they go to warmer climates, nor does the accidental want of them seem to be felt in situations where the most piercing cold reigns. Their legs and feet are always bare, if we except a sort of sandals made of the skins of oxen. The inhabitants of South America, compared with those of North America, are described as generally more feeble in their frame; less vigorous in the efforts of their mind; of gentler dispositions, more addicted to pleasure, and sunk in indolence.—This, however, is not universally the case. Many of their nations are as intrepid and enterprising as any others on the whole continent. Among the tribes on 14
the banks of the Oroonoko, if a warrior aspires to the post of captain, his probation begins with a long fast, more rigid than any ever observed by the most abstemious hermit. At the close of this the chiefs assemble; and each gives him three lashes with a large whip, applied so vigorously, that his body is almost flayed. If he betrays the least symptom of impatience, or even of sensibility, he is disgraced for ever, and rejected as unworthy of the honour. After some interval, his constancy is proved by a more excruciating trial. He is laid in his hammock with his hands bound fast; and an innumerable multitude of venomous ants, whose

Terrible trials undergone by their chiefs.

America. whose bite occasions a violent pain and inflammation, are thrown upon him. The judges of his merit stand around the hammock; and whilst these cruel insects fasten upon the most sensible parts of his body, a sigh, a groan, or an involuntary motion expressive of what he suffers, would exclude him from the dignity of which he is ambitious. Even after this evidence, his fortitude is not deemed to be sufficiently ascertained, till he has stood another test more severe, if possible, than the former. He is again suspended in his hammock, and covered with the leaves of the palmetto. A fire of stinking herbs is kindled underneath, so as he may feel its heat, and be involved in smoke. Though scorched and almost suffocated, he must continue to endure this with the same patient insensibility. Many perish in this essay of their firmness and courage; but such as go through it with applause, receive the ensigns of their new dignity with much solemnity, and are ever after regarded as leaders of approved resolution, whose behaviour, in the most trying situations, will do honour to their country. In North America, the previous trial of a warrior is neither so formal nor so severe: Though, even there, before a youth is permitted to bear arms, his patience and fortitude are proved by blows, by fire, and by insults, more intolerable to a haughty spirit than either.

15
Customs and dispositions of the North Americans more particularly.

Of the manners and customs of the North Americans more particularly, the following is the most consistent account that can be collected from the best informed and most impartial writers.

When the Europeans first arrived in America, they found the Indians quite naked, except those parts which even the most uncultivated people usually conceal. Since that time, however, they generally use a coarse blanket, which they buy of the neighbouring planters.

Their huts or cabbins are made of stakes of wood driven into the ground, and covered with branches of trees or reeds. They lie on the floor either on mats or the skins of wild beasts. Their dishes are of timber; but their spoons are made of the skulls of wild oxen, and their knives of flint. A kettle and a large plate constitute almost the whole utensils of the family. Their diet consists chiefly in what they procure by hunting; and sagamite, or pottage, is likewise one of their most common kinds of food. The most honourable furniture amongst them is the scalps of their enemies; with those they ornament their huts, which are esteemed in proportion to the number of this sort of spoils.

The character of the Indians is altogether founded upon their circumstances and way of life. A people who are constantly employed in procuring the means of a precarious subsistence, who live by hunting the wild animals, and who are generally engaged in war with their neighbours, cannot be supposed to enjoy much gaiety of temper, or a high flow of spirits. The Indians therefore are in general grave even to sadness; they have nothing of that giddy vivacity peculiar to some nations of Europe, and they despise it. Their behaviour to those about them is regular, modest, and respectful. Ignorant of the arts of amusement, of which that of saying trifles agreeably is one of the most considerable, they never speak but when they have something important to observe; and all their actions, words, and even looks, are attended with some meaning. This is extremely natural to men who are almost continually engaged in pursuits, which to them are of the highest importance. Their subsistence depends entirely on what they procure with their hands; and their lives, their honour, and every thing dear to them, may be lost by the smallest inattention to the designs of their enemies. As they have no particular object to attach them to one place rather than another, they fly wherever they expect to find the necessaries of life in greatest abundance. Cities, which are the effects of agriculture and arts, they have none. The different tribes or nations are for the same reason extremely small, when compared with civilized societies, in which industry, arts, agriculture, and commerce, have united a vast number of individuals, whom a complicated luxury renders useful to one another. These small tribes live at an immense distance; they are separated by a desert frontier, and hid in the bosom of impenetrable and almost boundless forests.

16
Their remarkable pensiveness and taciturnity.

17
Form of government among them.

There is established in each society a certain species of government, which over the whole continent of America prevails with exceeding little variation; because over the whole of this continent the manners and way of life are nearly similar and uniform. Without arts, riches, or luxury, the great instruments of subjection in polished societies, an American has no method by which he can render himself considerable among his companions, but by superiority in personal qualities of body or mind. But as Nature has not been very lavish in her personal distinctions, where all enjoy the same education, all are pretty much equal, and will desire to remain so. Liberty, therefore, is the prevailing passion of the Americans; and their government, under the influence of this sentiment, is better secured than by the wisest political regulations. They are very far, however, from despising all sort of authority; they are attentive to the voice of wisdom, which experience has conferred on the aged, and they enlist under the banners of the chief in whose valour and military address they have learned to repose their confidence. In every society, therefore, there is to be considered the power of the chief and of the elders; and according as the government inclines more to the one or to the other, it may be regarded as monarchical, or as a species of aristocracy. Among those tribes which are most engaged in war, the power of the chief is naturally predominant; because the idea of having a military leader was the first source of his superiority, and the continual exigencies of the state requiring such a leader, will continue to support, and even to enchance it. His power, however, is rather persuasive than coercive; he is reverenced as a father, rather than feared as a monarch. He has no guards, no prisons, no officers of justice, and one act of ill-judged violence would pull him from the throne. The elders, in the other form of government, which may be considered as an aristocracy, have no more power. In some tribes, indeed, there are a kind of hereditary nobility, whose influence being constantly augmented by time, is more considerable. (See the article NIAGARA.) But this source of power, which depends chiefly on the imagination, by which we annex to the merit of our contemporaries that of their forefathers, is too refined to be very common among the natives of America. In most

America.

moſt countries, therefore, age alone is ſufficient for acquiring reſpect, influence, and authority. It is age which teaches experience, and experience is the only ſource of knowledge among a barbarous people.

18 Their public aſſemblies.

Among thoſe perſons buſineſs is conducted with the utmoſt ſimplicity, and which may recal to thoſe who are acquainted with antiquity a picture of the moſt early ages. The heads of families meet together in a houſe or cabin appointed for the purpoſe. Here the buſineſs is diſcuſſed; and here thoſe of the nation, diſtinguiſhed for their eloquence or wiſdom, have an opportunity of diſplaying thoſe talents. Their orators, like thoſe of Homer, expreſs themſelves in a bold figurative ſtyle, ſtronger than refined, or rather ſoftened nations can well bear, and with geſtures equally violent, but often extremely natural and expreſſive. When the buſineſs is over, and they happen to be well provided with food, they appoint a feaſt upon the occaſion, of which almoſt the whole nation partakes. The feaſt is accompanied with a ſong, in which the real or fabulous exploits of their foreſathers are celebrated. They have dances too, though, like thoſe of the Greeks and Romans, chiefly of the military kind; and their muſic and dancing accompany every feaſt.

To aſſiſt their memory, they have belts of ſmall ſhells, or beads, of different colours, each repreſenting a particular object, which is marked by their colour and arrangement. At the concluſion of every ſubject

19 Wampum or belts.

on which they diſcourſe, when they treat with a foreign ſtate, they deliver one of thoſe belts; for if this ceremony ſhould be omitted, all that they have ſaid paſſes for nothing. Thoſe belts are carefully depoſited in each town, as the public records of the nation; and to them they occaſionally have recourſe, when any public conteſt happens with a neighbouring tribe. Of late, as the materials of which thoſe belts are made, have become ſcarce, they often give ſome ſkin in place of the wampum (the name of the beads), and receive in return preſents of a more valuable return from our commiſſioners; for they never conſider a treaty as of any weight, unleſs every article in it be ratified by ſuch a gratification.

It often happens, that thoſe different tribes or nations, ſcattered as they are at an immenſe diſtance from one another, meet in their excurſions after prey. If there ſubſiſts no animoſity between them, which ſeldom is the caſe, they behave in the moſt friendly and courteous manner; but if they happen to be in a ſtate of war, or if there has been no previous intercourſe between them, all who are not friends are deemed enemies, and they fight with the moſt ſavage fury.

20 Their wars.

War, if we except hunting, is the only employment of the men; as to every other concern, and even the little agriculture they enjoy, it is left to the women. Their moſt common motive for entering into war, when it does not ariſe from an accidental rencounter or interference, is either to revenge themſelves for the death of ſome loſt friends, or to acquire priſoners, who may aſſiſt them in their hunting, and whom they adopt into their ſociety. Theſe wars are either undertaken by ſome private adventurers, or at the inſtance of the whole community. In the latter caſe, all the young men who are diſpoſed to go out to battle (for no one is compelled contrary to his inclination), give a bit of wood to the chief, as a token of their deſign to accompany him; for every thing among theſe people is tranſacted with a great deal of ceremony and many forms. The chief who is to conduct them faſts ſeve- 21 Ceremonies before ſetting out.

ral days, during which he converſes with no one, and is particularly careful to obſerve his dreams; which the preſumption natural to ſavages generally renders as favourable as he could deſire. A variety of other ſuperſtitions and ceremonies are obſerved. One of the moſt hideous is ſetting the war-kettle on the fire, as an emblem that they are going out to devour their enemies; which among ſome nations muſt formerly have been the caſe, ſince they ſtill continue to expreſs it in clear terms, and uſe an emblem ſignificant of the ancient uſage. Then they diſpatch a porcelane, or large ſhell, to their allies, inviting them to come along, and drink the blood of their enemies. For with the Americans, as with the Greeks of old,

"A generous friendſhip no cold medium knows;
"But with one love, with one reſentment, glows."

They think that thoſe in their alliance muſt not only adopt their enmities, but have their reſentment wound up to the ſame pitch with themſelves. And indeed no people carry their friendſhips or their reſentment ſo far as they do; and this is what ſhould be expected from their peculiar circumſtances: that principle in human nature which is the ſpring of the ſocial affections, acts with ſo much the greater force the more it is reſtrained. The Americans, who live in ſmall ſocieties, who ſee few objects and few perſons, become wonderfully attached to theſe objects and perſons, and cannot be deprived of them without feeling themſelves miſerable. Their ideas are too confined to enable them to entertain juſt ſentiments of humanity, or univerſal benevolence. But this very circumſtance, while it makes them cruel and ſavage to an incredible degree, towards thoſe with whom they are at war, adds a new force to their particular friendſhips, and to the common tie which unites the members of the ſame tribe, or of thoſe different tribes which are in alliance with one another. Without attending to this reflection, ſome facts we are going to relate would excite our wonder without informing our reaſon, and we would be bewildered in a number of particulars, ſeemingly oppoſite to one another, without being ſenſible of the general cauſe from which they proceed.

Having finiſhed all the ceremonies previous to the war, and the day appointed for their ſetting out on the expedition being arrived, they take leave of their friends, and exchange their clothes, or whatever moveables they have, in token of mutual friendſhip; after which they proceed from the town, their wives and female relations walking before, and attending them to ſome diſtance. The warriors march all dreſſed in their fineſt apparel and moſt ſhowy ornaments, without any order. The chief walks ſlowly before them, ſinging the war-ſong, while the reſt obſerve the moſt profound ſilence. When they come up to their women, they deliver them all their finery, and putting on their worſt clothes, proceed on their expedition.

Every nation has its peculiar enſign or ſtandard, 22 Enſigns.

which is generally ſome beaſt, bird, or fiſh. Thoſe among the Five Nations are the bear, otter, wolf, tortoiſe, and eagle; and by theſe names the tribes are uſually diſtinguiſhed. They have the figures of thoſe

America. animals pricked and painted on ſeveral parts of their bodies; and when they march through the woods, they commonly, at every encampment, cut the repreſentation of their enſign on trees, eſpecially after a ſucceſsful campaign: marking at the ſame time the
23 Military habits. number of ſcalps or priſoners they have taken. Their military dreſs is extremely ſingular. They cut off or pull out all their hair, except a ſpot about the breadth of two Engliſh crown-pieces, near the top of their heads, and entirely deſtroy their eye-brows. The lock left upon their heads is divided into ſeveral parcels, each of which is ſtiffened and adorned with wampum, beads, and feathers of various kinds, the whole being twiſted into a form much reſembling the modern pompoon. Their heads are painted red down to the eye-brows, and ſprinkled over with white down. The griſtles of their ears are ſplit almoſt quite round, and diſtended with wires or ſplinters ſo as to meet and tie together on the nape of the neck. Theſe are alſo hung with ornaments, and generally bear the repreſentation of ſome bird or beaſt. Their noſes are likewiſe bored and hung with trinkets of beads, and their faces painted with various colours ſo as to make an awful appearance. Their breaſts are adorned with a gorget or medal, of braſs, copper, or ſome other metal; and that dreadful weapon the ſcalping-knife hangs by a ſtring from their neck.

The great qualities in an Indian war are vigilance and attention, to give and to avoid a ſurpriſe; and indeed in theſe they are ſuperior to all nations in the
24 Quickneſs of their ſenſes. world. Accuſtomed to continual wandering in the foreſts, having their perceptions ſharpened by keen neceſſity, and living in every reſpect according to nature, their external ſenſes have a degree of acuteneſs which at firſt view appears incredible. They can trace out their enemies at an immenſe diſtance by the ſmoke of their fires, which they ſmell, and by the tracks of their feet on the ground, imperceptible to an European eye, but which they can count and diſtinguiſh with the utmoſt facility. They can even diſtinguiſh the different nations with whom they are acquainted, and can determine the preciſe time when they paſſed, where an European could not, with all his glaſſes, diſtinguiſh footſteps at all. Theſe circumſtances, however, are of ſmall importance, becauſe their enemies are no leſs acquainted with them. When they go out, therefore, they take care to avoid making uſe of any thing by which they might run the danger of a diſcovery. They light no fire to warm themſelves or to prepare their victuals: they lie cloſe to the ground all day, and travel only in the night; and marching along in files, he that cloſes the rear diligently covers with
25 Vigilance and circumſpection. leaves the tracks of his own feet and of theirs who preceded him. When they halt to refreſh themſelves, ſcouts are ſent out to reconnoitre the country and beat up every place where they ſuſpect an enemy to lie concealed. In this manner they enter unawares the villages of their foes; and while the flower of the nation are engaged in hunting, maſſacre all the children, women, and helpleſs old men, or make priſoners of as many as they can manage, or have ſtrength enough to be uſeful to their nation. But when the enemy is appriſed of their deſign, and coming on in arms againſt them, they throw themſelves flat on the ground among the withered herbs and leaves, which their faces are painted to reſemble. Then they allow a part to paſs unmoleſted, when all at once, with a tremendous ſhout, riſing up from their ambuſh, they pour a ſtorm of 26
muſket-bullets on their foes. The party attacked re- Manner of fighting.
turns the ſame cry. Every one ſhelters himſelf with a tree, and returns the fire of the adverſe party, as ſoon as they raiſe themſelves from the ground to give a ſecond fire. Thus does the battle continue until the one party is ſo much weakened as to be incapable of farther reſiſtance. But if the force on each ſide continues nearly equal, the fierce ſpirits of the ſavages, inflamed by the loſs of their friends, can no longer be reſtrained. They abandon their diſtant war, they ruſh upon one another with clubs and hatchets in their hands, magnifying their own courage, and inſulting their enemies with the bittereſt reproaches. A cruel combat enſues, death appears in a thouſand hideous forms, which would congeal the blood of civilized nations to behold, but which rouſe the fury of ſavages. They trample, they inſult over the dead bodies, tearing the ſcalp from the head, wallowing in their blood like wild beaſts, and ſometimes devouring their fleſh. The flame rages on till it meets with no reſiſtance; then the priſoners are ſecured, thoſe unhappy men, whoſe fate is a thouſand times more dreadful than theirs who have died in the field. The conquerors ſet up a hideous howling to lament the friends they have loſt. They approach in a melancholy and ſevere gloom to their own village; a meſſenger is ſent to announce their arrival, and the women, with frightful ſhrieks, come out to mourn their dead brothers or their huſbands. When they are arrived, the chief relates in a low voice to the elders, a circumſtantial account of every particular of the expedition. The orator proclaims aloud this account to the people; and as he mentions the names of thoſe who have fallen, the ſhrieks of the women are redoubled. The men too join in theſe cries, according as each is moſt connected with the deceaſed by blood or friendſhip. The laſt ceremony is the proclamation of the victory; each individual then forgets his private misfortunes, and joins in the triumph of his nation; all tears are wiped from their eyes, and by an unaccountable tranſition, they paſs in a moment from the bitterneſs of ſorrow to an extravagance of joy. But the treatment of the priſoners, whoſe fate all this time remains undecided, is what chiefly characteriſes the ſavages.

We have already mentioned the ſtrength of their affections or reſentments. United as they are in ſmall ſocieties, connected within themſelves by the firmeſt ties, their friendly affections, which glow with the moſt intenſe warmth within the walls of their own village, ſeldom extend beyond them. They feel nothing for the enemies of their nation; and their reſentment is eaſily extended from the individual who has injured them to all others of the ſame tribe. The priſoners, who have themſelves the ſame feelings, know the intentions of their conquerors, and are prepared for them. 27
The perſon who has taken the captive attends him to Treatment of their priſoners.
the cottage, where, according to the diſtribution made by the elders, he is to be delivered to ſupply the loſs of a citizen. If thoſe who receive him have their family weakened by war or other accidents, they adopt the captive into the family, of which he becomes a member. But if they have no occaſion for him, or

America.

their resentment for the loss of their friends be too high to endure the sight of any connected with those who were concerned in it, they sentence him to death. All those who have met with the same severe sentence being collected, the whole nation is assembled at the execution, as for some great solemnity. A scaffold is erected, and the prisoners are tied to the stake, where they commence their death-song, and prepare for the ensuing scene of cruelty with the most undaunted courage. Their enemies, on the other side, are determined to put it to the proof, by the most refined and exquisite tortures. They begin at the extremity of his body, and gradually approach the more vital parts. One plucks out his nails by the roots, one by one; another takes a finger into his mouth, and tears off the flesh with his teeth; a third thrusts the finger, mangled as it is, into the bowl of a pipe made red-hot, which he smokes like tobacco; then they pound his toes and fingers to pieces between two stones; they cut circles about his joints, and gashes in the fleshy parts of his limbs, which they sear immediately with red-hot irons, cutting, burning, and pinching them alternately; they pull off this flesh, thus mangled and roasted, bit by bit, devouring it with greediness, and smearing their faces with the blood in an enthusiasm of horror and fury. When they have thus torn off the flesh, they twist the bare nerves and tendons about an iron, tearing and snapping them, whilst others are employed in pulling and extending their limbs in every way that can increase the torment. This continues often five or six hours; and sometimes, such is the strength of the savages, days together. Then they frequently unbind him, to give a breathing to their fury, to think what new torments they shall inflict, and to refresh the strength of the sufferer, who, wearied out with such a variety of unheard-of torments, often falls into so profound a sleep, that they are obliged to apply the fire to awake him, and renew his sufferings. He is again fastened to the stake, and again they renew their cruelty; they stick him all over with small matches of wood that easily takes fire, but burns slowly; they continually run sharp reeds into every part of his body; they drag out his teeth with pincers, and thrust out his eyes; and lastly, after having burned his flesh from the bones with slow fires; after having so mangled the body that it is all but one wound; after having mutilated his face in such a manner as to carry nothing human in it; after having peeled the skin from the head, and poured a heap of red-hot coals or boiling water on the naked skull—they once more unbind the wretch; who, blind, and staggering with pain and weakness, assaulted and pelted upon every side with clubs and stones, now up, now down, falling into their fires at every step, runs hither and thither, until one of the chiefs, whether out of compassion, or weary of cruelty, puts an end to his life with a club or dagger. The body is then put into a kettle, and this barbarous employment is succeeded by a feast as barbarous.

28 Shocking tortures.

The women, forgetting the human as well as the female nature, and transformed into something worse than furies, even outdo the men in this scene of horror; while the principal persons of the country sit round the stake, smoking and looking on without the least emotion. What is most extraordinary, the sufferer himself, in the little intervals of his torments, smokes too, appears unconcerned, and converses with his torturers about indifferent matters. Indeed, during the whole time of his execution, there seems a contest which shall exceed, they in inflicting the most horrid pains, or he in enduring them with a firmness and constancy almost above human: not a groan, not a sigh, not a distortion of countenance, escapes him; he possesses his mind entirely in the midst of his torments; he recounts his own exploits; he informs them what cruelties he has inflicted upon their countrymen, and threatens them with the revenge that will attend his death; and, though his reproaches exasperate them to a perfect madness of rage and fury, he continues his insults even of their ignorance of the art of tormenting, pointing out himself more exquisite methods, and more sensible parts of the body to be afflicted. The women have this part of courage as well as the men; and it is as rare for an Indian to behave otherwise as it would be for any European to suffer as an Indian. Such is the wonderful power of an early institution, and a ferocious thirst of glory. "I am brave and intrepid (exclaims the savage in the face of his tormentors); I do not fear death, nor any kind of tortures; those who fear them are cowards; they are less than women; life is nothing to those that have courage: May my enemies be confounded with despair and rage! Oh! that I could devour them, and drink their blood to the last drop."

29 Constancy of the sufferers.

But neither the intrepidity on one side, nor the inflexibility on the other, are among themselves matter of astonishment: for vengeance, and fortitude in the midst of torment, are duties which they consider as sacred; they are the effects of their earliest education, and depend upon principles instilled into them from their infancy. On all other occasions they are humane and compassionate. Nothing can exceed the warmth of their affection towards their friends, who consist of all those who live in the same village, or are in alliance with it: among these all things are common; and this, though it may in part arise from their not possessing very distinct notions of separate property, is chiefly to be attributed to the strength of their attachment; because in every thing else, with their lives as well as their fortunes, they are ready to serve their friends. Their houses, their provision, even their young women, are not enough to oblige a guest. Has any one of these succeeded ill in his hunting? Has his harvest failed? or is his house burned? He feels no other effect of his misfortunes, than that it gives him an opportunity to experience the benevolence and regard of his fellow-citizens. On the other hand, to the enemies of his country, or to those who have privately offended, the American is implacable. He conceals his sentiments, he appears reconciled until by some treachery or surprise he has an opportunity of executing an horrible revenge. No length of time is sufficient to allay his resentment; no distance of place great enough to protect the object; he crosses the steepest mountains, he pierces the most impracticable forests, and traverses the most hideous bogs and desarts for several hundreds of miles; bearing the inclemency of the seasons, the fatigue of the expedition, the extremes of hunger and thirst, with patience and cheerfulness, in hopes of surprising his enemy, on whom he exercises the most shocking barbarities, even to the eating of his flesh. To such extremes

30 Surprising contrast in the American character.

America.

tremes do the Indians push their friendship or their enmity; and such indeed, in general, is the character of all strong and uncultivated minds.

31 Treatment of their dead friends.

But what we have said respecting the Indians would be a faint picture, did we omit observing the force of their friendship, which principally appears by the treatment of their dead. When any one of the society is cut off, he is lamented by the whole: on this occasion a thousand ceremonies are practised, denoting the most lively sorrow. No business is transacted, however pressing, till all the pious ceremonies due to the dead are performed. The body is washed, anointed, and painted. Then the women lament the loss with hideous howlings, intermixed with songs which celebrate the great actions of the deceased and his ancestors. The men mourn in a less extravagant manner. The whole village is present at the interment, and the corpse is habited in their most sumptuous ornaments. Close to the body of the defunct are placed his bows and arrows, with whatever he valued most in his life, and a quantity of provision for his subsistence on the journey which he is supposed to take. This solemnity, like every other, is attended with feasting. The funeral being ended, the relations of the deceased confine themselves to their huts for a considerable time to indulge their grief. After an interval of some weeks they visit the grave, repeat their sorrow, new clothe the remains of the body, and act over again all the solemnities of the funeral.

Among the various tokens of their regard for their deceased friends, the most remarkable is what they call the *feast of the dead*, or the *feast of souls*. The day for this ceremony is appointed in the council of their chiefs, who give orders for every thing which may enable them to celebrate it with pomp and magnificence; and the neighbouring nations are invited to partake of the entertainment. At this time, all who have died since the preceding feast of the kind are taken out of their graves. Even those who have been interred at the greatest distance from the villages are diligently sought for, and conducted to this rendezvous of the dead, which exhibits a scene of horror beyond the power of description. When the feast is concluded, the bodies are dressed in the finest skins which can be procured, and after being exposed for some time in this pomp, are again committed to the earth with great solemnity, which is succeeded by funeral games.

32 Superstitions.

Their taste for war, which forms the chief ingredient in their character, gives a strong bias to their religion. Areskoui, or the god of battle, is revered as the great god of the Indians. Him they invoke before they go into the field; and according as his disposition is more or less favourable to them, they conclude they will be more or less successful. Some nations worship the sun and moon; among others there are a number of traditions, relative to the creation of the world and the history of the gods: traditions which resemble the Grecian fables, but which are still more absurd and inconsistent. But religion is not the prevailing character of the Indians; and except when they have some immediate occasion for the assistance of their gods, they pay them no sort of worship. Like all rude nations, however, they are strongly addicted to superstition. They believe in the existence of a number of good and bad genii or spirits, who interfere in the affairs of mortals, and produce all our happiness or misery. It is from the evil genii, in particular, that our diseases proceed; and it is to the good genii we are indebted for a cure. The ministers of the genii are the jugglers, who are also the only physicians among the savages. These jugglers are supposed to be inspired by the good genii, most commonly in their dreams, with the knowledge of future events; they are called in to the assistance of the sick, and are supposed to be informed by the genii whether they will get over the disease, and in what way they must be treated. But these spirits are extremely simple in their system of physic, and, in almost every disease, direct the juggler to the same remedy. The patient is inclosed in a narrow cabin, in the midst of which is a stone red-hot; on this they throw water, until he is well soaked with the warm vapour and his own sweat. Then they hurry him from this bagnio, and plunge him suddenly into the next river. This coarse method, which costs many their lives, often performs very extraordinary cures. The jugglers have likewise the use of some specifics of wonderful efficacy; and all the savages are dexterous in curing wounds by the application of herbs. But the power of these remedies is always attributed to the magical ceremonies with which they are administered.

33 Condition of their women.

Though the women generally bear the laborious part of domestic œconomy, their condition is far from being so slavish as it appears. On the contrary, the greatest respect is paid by the men to the female sex. The women even hold their councils, and have their share in all deliberations which concern the state. Polygamy is practised by some nations, but is not general. In most, they content themselves with one wife; but a divorce is admitted in case of adultery. No nation of the Americans is without a regular marriage, in which there are many ceremonies; the principal of which is, the bride's presenting the bridegroom with a plate of their corn. The women, though before incontinent, are remarkable for chastity after marriage.

34 Their ardent love of liberty.

Liberty, in its full extent, being the darling passion of the Indians, their education is directed in such a manner as to cherish this disposition to the utmost. Hence children are never upon any account chastised with blows, and they are seldom even reprimanded. Reason, they say, will guide their children when they come to the use of it, and before that time their faults cannot be very great: but blows might damp their free and martial spirit, by the habit of a slavish motive to action. When grown up, they experience nothing like command, dependence, or subordination; even strong persuasion is industriously with-held by those who have influence among them.—No man is held in great esteem, unless he has increased the strength of his country with a captive, or adorned his hut with a scalp of one of his enemies.

Controversies among the Indians are few, and quickly decided. When any criminal matter is so flagrant as to become a national concern, it is brought under the jurisdiction of the great council; but in ordinary cases, the crime is either revenged or compromised by the parties concerned. If a murder be committed, the family which has lost a relation prepares to retaliate on that of the offender. They often kill the murderer; and when this happens, the kindred of the last person slain

35 Crimes and punishments.

America. ſlain look upon themſelves to be as much injured, and to have the ſame right to vengeance, as the other party. In general, however, the offender abſents himſelf; the friends ſend compliments of condolence to thoſe of the perſon that has been murdered. The head of the family at length appears with a number of preſents, the delivery of which he accompanies with a formal ſpeech. The whole ends, as uſual, in mutual feaſtings, ſongs, and dances. If the murder is committed by one of the ſame family or cabin, that cabin has the full right of judgment within itſelf, either to puniſh the guilty with death, or to pardon him, or to oblige him to give ſome recompence to the wife or children of the ſlain. Inſtances of ſuch a crime, however, very ſeldom happen; for their attachment to thoſe of the ſame family is remarkably ſtrong, and is ſaid to produce ſuch friendſhips as may vie with the moſt celebrated in fabulous antiquity.

36 Peculiar manners of different nations.

Such, in general, are the manners and cuſtoms of the Indian nations; but every tribe has ſomething peculiar to itſelf. Among the Hurons and Natchez, the dignity of the chief is hereditary, and the right of ſucceſſion in the female line. When this happens to be extinct, the moſt reſpectable matron of the tribe makes choice of whom ſhe pleaſes to ſucceed.

The Cherokees are governed by ſeveral ſachems or chiefs, elected by the different villages; as are alſo the Creeks and Chactaws. The two latter puniſh adultery in a woman by cutting off her hair, which they will not ſuffer to grow till the corn is ripe the next ſeaſon; but the Illinois, for the ſame crime, cut off the womens noſes and ears.

The Indians on the lakes are formed into a ſort of empire; and the emperor is elected from the eldeſt tribe, which is that of the Ottowawas. He has the greateſt authority of any chief that has appeared on the continent ſince our acquaintance with it. A few years ago, the perſon who held this rank formed a deſign of uniting all the Indian nations under his ſovereignty; but he miſcarried in the attempt.

37 Longevity of the Indians.

In general the American Indians live to a great age, although it is not poſſible to know from themſelves the exact number of their years. It was aſked of an Indian, who appeared to be extremely old, what age he was of? I am above twenty, was his reply. Upon putting the queſtion in a different form, by reminding him of certain circumſtances in former times, my machu, ſaid he, ſpoke to me when I was young of the Incas; and he had ſeen theſe princes. According to this reply, there muſt have elapſed, from the date of his machu's (his grandfather's) remembrance to that time, a peperiod of at leaſt 232 years. The man who made this reply appeared to be 120 years of age: for, beſides the whiteneſs of his hair and beard, his body was almoſt bent to the ground; without, however, ſhowing any other marks of debility or ſuffering. This happened in 1764. This longevity, attended in general with uninterrupted health, is probably the conſequence in part of their vacancy from all ſerious thought and employment, joined alſo with the robuſt texture and conformation of their bodily organs. If the Indians did not deſtroy one another in their almoſt perpetual wars, and if their habits of intoxication were not ſo univerſal and incurable, they would be, of all the races of men who inhabit the globe, the moſt likely to prolong, not only the bounds, but the enjoyments, of animal life to their utmoſt duration. America.

38 Other pictures of the Americans.

Let us now attend to other pictures which have been given of the aboriginal inhabitants of the New World. The vices and defects of the American Indians have by ſeveral writers been moſt unaccountably aggravated, and every virtue and good quality denied them. Their cruelties have been already deſcribed and accounted for. The following anecdote of an Algonquin woman we find adduced as a remarkable proof of their innate thirſt of blood. That nation being at war with the Iroquois, ſhe happened to be carried priſoner, and was carried to one of the villages belonging to them. Here ſhe was ſtripped naked, and her hands and feet bound with ropes in one of their cabins. In this condition ſhe remained ten days, the ſavages ſleeping round her every night. The eleventh night, while they were aſleep, ſhe found means to diſengage one of her hands, with which ſhe immediately freed herſelf from the ropes, and went to the door. Though ſhe had now an opportunity of eſcaping unperceived, her revengeful temper could not let ſlip ſo favourable an opportunity of killing one of her enemies. The attempt was manifeſtly at the hazard of her own life; yet, ſnatching up a hatchet, ſhe killed the ſavage that lay next her; and, ſpringing out of the cabin, concealed herſelf in a hollow tree which ſhe had obſerved the day before. The groans of the dying perſon ſoon alarmed the other ſavages, and the young ones immediately ſet out in purſuit of her.—Perceiving from her tree, that they all directed their courſe one way, and that no ſavage was near her, ſhe left her ſanctuary, and, flying by an oppoſite direction, ran into a foreſt without being perceived. The ſecond day after this happened, her footſteps were diſcovered; and they purſued her with ſuch expedition, that the third day ſhe diſcovered her enemies at her heels. Upon this ſhe threw herſelf into a pond of water; and, diving among ſome weeds and bulruſhes, ſhe could juſt breathe above water without being perceived. Her purſuers, after making the moſt diligent ſearch, were forced to return. —For 35 days this woman held on her courſe through woods and deſarts, without any other ſuſtenance than roots and wild berries. When ſhe came to the river St Lawrence, ſhe made with her own hands a kind of a wicker raft, on which ſhe croſſed it. As ſhe went by the French for Trois Rivieres, without well knowing where ſhe was, ſhe perceived a canoe full of ſavages; and fearing they might be Iroquois, ran again into the woods, where ſhe remained till ſunſet.—Continuing her courſe ſoon after, ſhe ſaw Trois Riviers; and was then diſcovered by a party whom ſhe knew to be Hurons, a nation in alliance with the Algonquins. She then ſquatted down behind a buſh, calling out to them that ſhe was not in a condition to be ſeen, becauſe ſhe was naked. They immediately threw her a blanket, and then conducted her to the fort, where ſhe recounted her ſtory.

39 Anecdotes of an Algonquin woman.

40 Reproached with puſilanimity.

Perſonal courage has been denied them. In proof of their puſilanimity, the following incidents are quoted from Charlevoix by Lord Kames, in his Sketches of the Hiſtory of Man. "The fort de Vercheres in Canada, belonging to the French, was, in the year 1690, at-

America. attacked by fome Iroquois. They approached filently, preparing to fcale the palafade, when fome mufket-fhot made them retire. Advancing a fecond time, they were again repulfed, wondering that they could difcover none but a woman, who was feen every where. This was Madame de Vercheres, who appeared as refolute as if fupported by a numerous garrifon. The hopes of ftorming a place without men to defend it, occafioned reiterated attacks. After two days fiege, they retired, fearing to be intercepted in their retreat. Two years after, a party of the fame nation appeared before the fort fo unexpectedly, that a girl of fourteen, daughter of the proprietor, had but time to fhut the gate. With the young woman there was not a foul but one raw foldier. She fhowed herfelf with her affiftant, fometimes in one place and fometimes in another; changing her drefs frequently, in order to give fome appearance of a garrifon; and always fired opportunely. The faint-hearted Iroquois decamped without fuccefs."

There is no inftance, it is faid, either of a fingle Indian facing an individual of any other nation in fair and open combat, or of their jointly venturing to try the fate of battle with an equal number of any foes. Even with the greateft fuperiority of numbers they dare not meet an open attack. Yet notwithftanding this want of courage, they are ftill formidable; nay, it has been known, that a fmall party of them has routed a much fuperior body of regular troops: but this can only happen when they have furprifed them in the faftneffes of their forefts, where the covert of the wood may conceal them until they take their aim with the utmoft certainty. After one fuch difcharge they immediately retreat, without leaving the fmalleft trace of their route. It may eafily be fuppofed, that an onfet of this kind muft produce confufion even among the fteadieft troops, when they can neither know the number of their enemies, nor perceive the place where they lie in ambufh.

41
Accufed of perfidy.

Perfidy combined with cruelty has been alfo made a part of their character. Don Ulloa relates, That the Indians of the country called *Natches*, in Louifiana, laid a plot of maffacring in one night every individual belonging to the French colony eftablifhed there. This plot they actually executed, notwithftanding the feeming good underftanding that fubfifted between them and thefe European neighbours. Such was the fecrecy which they obferved, that no perfon had the leaft fufpicion of their defign until the blow was ftruck. One Frenchman alone efcaped, by favour of the darknefs, to relate the difafter of his countrymen. The compaffion of a female Indian contributed alfo in fome meafure to his exemption from the general maffacre. The tribe of Natches had invited the Indians of other countries, even to a confiderable diftance, to join in the fame confpiracy. The day, or rather the night, was fixed, on which they were to make an united attack on the French colonifts. It was intimated by fending a parcel of rods, more or lefs numerous according to the local diftance of each tribe, with an injunction to abftract one rod daily; the day on which the laft fell to be taken away being that fixed for the execution of their plan. The women were partners of the bloody fecret. The parcels of rods being thus diftributed, that belonging to the tribe of Natches happened to remain in the cuftody of a female. This woman, either moved by her own feelings of compaffion, or by the commiferation expreffed by her female acquaintances in the view of the propofed fcene of bloodfhed, abftracted one day three or four of the rods, and thus anticipated the term of her tribe's proceeding to the execution of the general confpiracy. The confequence of this was, that the Natches were the only actors in this carnage; their diftant affociates having ftill feveral rods remaining at the time when the former made the attack. An opportunity was thereby given to the colonifts in thofe quarters to take meafures for their defence, and for preventing a more extenfive execution of the defign. America.

It was by confpiracies fimilar to this that the Indians of the province of Macas, in the kingdom of Quito, deftroyed the opulent city of Logrogno, the colony of Guambaya, and its capital Sevilla del Oro; and that fo completely, that it is no longer known in what place thefe fettlements exifted, or where that abundance of gold was found from which the laft-mentioned city took the addition to its name. Like ravages have been committed upon l'Imperiale in Chili, the colonies of the Miffions of Chuncas, thofe of Darien in Terra Firma, and many other places, which have afforded fcenes of this barbarous ferocity. Thefe confpiracies are always carried on in the fame manner. The fecret is inviolably kept, the actors affemble at the precife hour appointed, and every individual is animated with the fame fanguinary purpofes. The males that fall into their hands are put to death with every fhocking circumftance that can be fuggefted by a cool and determined cruelty. The females are carried off and preferved as monuments of their victory, to be employed as their occafions require.

Nor can this odious cruelty and treachery, it is faid, be juftly abfcribed to their fubjection to a foreign yoke, feeing the fame character belongs equally to all the original inhabitants of this vaft continent, even thofe who have preferved their independence moft completely. Certain it is, continues he, that thefe people, with the moft limited capacities for every thing elfe, difplay an aftonifhing degree of penetration and fubtlety with refpect to every object that involves treachery, bloodfhed, and rapine. As to thefe, they feem to have been all educated at one fchool; and a fecret, referring to any fuch plan, no confideration on earth can extort from them.

42
Their underftandings reprefented as weak.

Their underftandings alfo have been reprefented as not lefs contemptible than their manners are grofs and brutal. Many nations are neither capable of forming an arrangement for futurity, nor did their folicitude or forefight extend fo far. They fet no value upon thofe things of which they were not in fome immediate want. In the evening, when a Carib is going to reft, no confideration will tempt him to fell his hammock; but in the morning he will part with it for the flighteft trifle. At the clofe of winter, a North American, mindful of what he has fuffered from the cold, fets himfelf with vigour to prepare materials for erecting a comfortable hut to protect him againft the inclemency of the fucceeding feafon: but as foon as the weather becomes mild, he abandons his work, and never thinks of it more till the return of the cold compels him to refume it.—In fhort, to be free from labour feems to be the utmoft wifh of an American. They will continue whole days ftretched in their hammocks,

America. mocks, or feated on the earth, without changing their pofture, raifing their eyes, or uttering a fingle word. They cannot compute the fucceffion of days nor of weeks. The different afpects of the moon alone engage their attention as a meafure of time. Of the year they have no other conception than what is fuggefted to them by the alternate heat of fummer and cold of winter; nor have they the leaft idea of applying to this period the obvious computation of the months which it contains. When it is afked of any old man in Peru, even the moft civilized, what age he is of? the only anfwer he can give is the number of caciques he has feen. It often happens, too, that they only recollect the moft diftant of thefe princes in whofe time certain circumftances had happened peculiarly memorable, while of thofe that lived in a more recent period they have loft all remembrance.

43 Alleged indolence and ftupidity.

The fame grofs ftupidity is alleged to be obfervable in thofe Indians who have retained their original liberty. They are never known to fix the dates of any events in their minds, or to trace the fucceffion of circumftances that have arifen from fuch events. Their imagination takes in only the prefent, and in that only what intimately concerns themfelves. Nor can difcipline or inftruction overcome this natural defect of apprehenfion. In fact, the fubjected Indians in Peru, who have a continual intercourfe with the Spaniards, who are furnifhed with curates perpetually occupied in giving them leffons of religion and morality, and who mix with all ranks of the civilized fociety eftablifhed among them, are almoft as ftupid and barbarous as their countrymen who have had no fuch advantages. The Peruvians, while they lived under the government of their Incas, preferved the records of certain remarkable events. They had alfo a kind of regular government, defcribed by the hiftorians of the conqueft of Peru. This government originated entirely from the attention and abilities of their princes, and from the regulations enacted by them for directing the conduct of their fubjects. This ancient degree of civilization among them gives ground to prefume that their legiflatures fprung from fome race more enlightened than the other tribes of Indians; a race of which no individual feems to remain in the prefent times.

44 Their vanity and conceit.

Vanity and conceit are faid to be blended with their ignorance and treachery. Notwithftanding all they fuffer from Europeans, they ftill, it is faid, confider themfelves as a race of men far fuperior to their conquerors. This proud belief, arifing from their perverted ideas of excellence, is univerfal over the whole known continent of America. They do not think it poffible that any people can be fo intelligent as themfelves. When they are detected in any of their plots, it is their common obfervation, that the Spaniards, or *Viracochas*, want to be as knowing as they are. Thofe of Louifiana and the countries adjacent, are equally vain of their fuperior underftanding, confounding that quality with the cunning which they themfelves conftantly practife. The whole object of their tranfactions is to over-reach thofe with whom they deal. Yet though faithlefs themfelves, they never forgive the breach of promife on the part of others. While the Europeans feek their amity by prefents, they give themfelves no concern to fecure a reciprocal friendfhip. Hence, probably, arifes their idea, that they muft be a fuperior race of men, in ability and intelligence, to thofe who are at fuch pains to court their alliance, and avert their enmity. America.

45 Their eloquence difparaged.

Their natural eloquence has alfo been decried. The free tribes of favages who enter into conventions with the Europeans, it is obferved, are accuftomed to make long, pompous, and, according to their own notions, fublime harangues, but without any method or connection. The whole is a collection of disjointed metaphors and comparifons. The light, heat, and courfe of the fun, form the principal topic of their difcourfe; and thefe unintelligible reafonings are always accompanied with violent and ridiculous geftures. Numberlefs repetitions prolong the oration, which, if not interrupted, would laft whole days: At the fame time, they meditate very accurately before hand, in order to avoid mentioning any thing but what they are defirous to obtain. This pompous faculty of making fpeeches is alfo one of the grounds on which they conceive themfelves to be fuperior to the nations of Europe: They imagine that it is their eloquence that procures them the favours they afk. The fubjected Indians converfe precifely in the fame ftyle. Prolix and tedious, they never know when to ftop; fo that, excepting by the difference in language, it would be impoffible, in this refpect, to diftinguifh a civilized Peruvian from an inhabitant of the moft favage diftricts to the northward.

46 All thefe views partial and not free from mifreprefentation.

But fuch partial and detached views as the above, were they even free from mifreprefentation, are not the juft ground upon which to form an eftimate of their character. Their qualities, good and bad (for they certainly poffefs both), their way of life, the ftate of fociety among them, with all the circumftances of their condition, ought to be confidered in connection, and in regard to their mutual influence. Such a view has been given in the preceding part of this article; from which, it is hoped, their real character may be eafily deduced.

Many of the difagreeable traits exhibited in the anecdotes juft quoted, are indeed extracted from Don Ulloa: an author of credit and reputation; but a Spaniard, and evidently biaffed in fome degree by a defire to palliate the enormities of his countrymen in that quarter of the globe. And, with regard to the worft and leaft equivocal parts of the American character, cruelty and revenge; it may be fairly queftioned, whether the inftances of thefe, either in refpect of their caufe or their atrocity, be at all comparable to thofe exhibited in European hiftory, and ftaining the annals of Chriftendom:—to thofe, for inftance, of the Spaniards themfelves, at their firft difcovery of America; to thofe indicated by the engines found on board their mighty Armada; to thofe which, in cold blood, were perpetrated by the Dutch at Amboyna; to the dragoonings of the French; to their religious maffacres; or even to the *tender mercies* of the Inquifition!

47 The phyfical defcriptions of Buffon and de Paw refuted.

Still harfher, however, are the defcriptions given by *Buffon* and *de Paw* of the natives of this whole continent, in which the moft mortifying degeneracy of the human race, as well as of all the inferior animals, is afferted to be confpicuous. Againft thofe philofophers, or rather theorifts, the Americans have found an able advocate in the Abbé *Clavigero*; an hiftorian, whofe

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whofe fituation and long refidence in America afforded him the beft means of information, and who, though himfelf a fubject of Spain, appears fuperior to prejudice, and difdains in his defcription the gloffes of policy.

Concerning the ftature of the Americans, M. de Paw fays, in general, that although it is not equal to the ftature of the Caftilians, there is but little difference between them. But the Abbé Clavigero evinces, that the Indians who inhabit thofe countries lying between 9 and 40 degrees of north latitude, which are the limits of the difcoveries of the Spaniards, are more than five Parifian feet in height, and that thofe who do not reach that ftature are as few in number amongft the Indians as they are amongft the Spaniards. It is befides certain, that many of thofe nations, as the *Apaches*, the *Hiaquefe*, the *Pimefe*, and *Cochimies*, are at leaft as tall as the talleft Europeans; and that, in all the vaft extent of the New World, no race of people has been found, except the Efquimaux, fo diminutive in ftature as the Laplanders, the *Samojeds*, and Tartars, in the north of the Old continent. In this refpect, therefore, the inhabitants of the two continents are upon an equality.

48 Stature, fhape, &c.

Of the fhape and character of the Mexican Indians, the Abbé gives a moft advantageous defcription; which he afferts no one who reads it in America will contradict, unlefs he views them with the eye of a prejudiced mind. It is true, that Ulloa fays, in fpeaking of the Indians of Quito, he had obferved, "that imperfect people abounded among them; that they were either irregularly diminutive, or monftrous in fome other refpect; that they became either infenfible, dumb, or blind; or wanted fome limb of their body." Having therefore made fome inquiry refpecting this fingularity of the Quitans, the Abbé found, that fuch defects were neither caufed by bad humours, nor by the climate, but by the miftaken and blind humanity of their parents, who, in order to free their children from the hardfhips and toils to which the healthy Indians are fubjected by the Spaniards, fix fome deformity or weaknefs upon them that they may become ufelefs: a circumftance of mifery which does not happen in other countries of America, nor in thofe places of the fame kingdom of Quito, where the Indians are under no fuch oppreffion. M. de Paw, and, in agreement with him, Dr Robertfon, fays, that no deformed perfons are to be found among the favages of America; becaufe, like the ancient Lacedemonians, they put to death thofe children which are born hunch-backed, blind, or defective in any limb; but that in thofe countries where they are formed into focieties, and the vigilance of their rulers prevent the murder of fuch infants, the number of their deformed individuals is greater than it is in any other country of Europe. This would make an exceeding good folution of the difficulty if it were true: but if, poffibly, there has been in America a tribe of favages who have imitated the barbarous example of the celebrated Lacedemonians, it is certain that thofe authors have no grounds to impute fuch inhumanity to the reft of the Americans; for that it has not been the practice, at leaft with the far greater part of thofe nations, is to be demonftrated from the atteftations of the authors the beft acquainted with their cuftoms.

No argument againft the New World can be drawn from the colour of the Americans: for their colour is lefs diftant from the white of the Europeans than it is from the black of the Africans, and a great part of the Afiatics. The hair of the Mexicans and of the greater part of the Indians is, as we have already faid, coarfe and thick; on their face they appear to have little, and in general none on their arms and legs: but it is an error to fay, as M. de Paw does, that they are entirely deftitute of hair in all the other parts of their body. This is one of the many paffages of the Philofophical Refearches, at which the Mexicans, and all the other nations, muft fmile to find an European philofopher fo eager to diveft them of the drefs they had from nature. Don Ulloa, indeed, in the defcription which he gives of the Indians of Quito, fays, that hair neither grows upon the men nor upon the women when they arrive at puberty, as it does on the reft of mankind; but whatever fingularity may attend the Quitans, or occafion this circumftance, there is no doubt that among the Americans in general, the period of puberty is accompanied with the fame fymptoms as it is among other nations of the world. In fact, with the North Americans, it is difgraceful to be hairy on the body. They fay it likens them to hogs. They therefore pluck the hair as faft as it appears. But the traders who marry their women, and prevail on them to difcontinue this practice, fay, that nature is the fame with them as with the whites. As to the beards of the men, had Buffon or de Paw known the pains and trouble it cofts them to pluck out by the roots the hair that grows on their faces, they would have feen that nature had not been deficient in that refpect. Every nation has its cuftoms. "I have feen an Indian beau, with a looking-glafs in his hand (fays Mr Jefferfon), examining his face for hours together, and plucking out by the roots every hair he could difcover, with a kind of tweezer made of a piece of fine brafs wire, that had been twifted round a ftick, and which he ufed with great dexterity."

49 Errors concerning their want of beard, &c.

50 Their form and afpect contrafted with thofe of fome other nations.

The very afpect of an Angolan, Mandingan, or Congan, would have fhocked M. de Paw, and made him recall that cenfure which he paffes on the colour, the make, and hair of the Americans. What can be imagined more contrary to the idea we have of beauty, and the perfection of the human frame, than a man whofe body emits a rank fmell, whofe fkin is as black as ink, whofe head and face are covered with black wool inftead of hair, whofe eyes are yellow and bloody, whofe lips are thick and blackifh, and whofe nofe is flat? Such are the inhabitants of a very large portion of Africa, and of many iflands of Afia. What men can be more imperfect than thofe who meafure no more than four feet in ftature, whofe faces are long and flat, the nofe compreffed, the irides yellowifh black, the eyelids turned back towards the temples, the cheeks extraordinarily elevated, their mouths monftroufly large, their lips thick and prominent, and the lower part of their vifages extremely narrow? Such, according to Count de Buffon, are the Laplanders, the Zemblans, the Borandines, the Samojeds, and Tartars in the Eaft. What objects more deformed than men whofe faces are too long and wrinkled even in their youth, their nofes thick and compreffed, their eyes fmall and funk, their cheeks very much raifed, the upper jaw low, their teeth long

America. long and disunited, eye-brows so thick that they shade their eyes; the eye-lids thick, some bristles on their faces instead of beard, large thighs and small legs? Such is the picture Count de Buffon gives of the Tartars; that is, of those people who, as he says, inhabit a tract of land in Asia 1200 leagues long and upwards, and more than 750 broad. Amongst these the Calmucks are the most remarkable for their deformity; which is so great, that, according to Tavernier, they are the most brutal men of all the universe. Their faces are so broad that there is a space of five or six inches between their eyes, according as Count de Buffon himself affirms. In Calicut, in Ceylon, and other countries of India, there is, say Pyrard and other writers on those regions, a race of men who have one or both of their legs as thick as the body of a man; and that this deformity among them is almost hereditary. The Hottentots, besides other gross imperfections, have that monstrous irregularity attending them, of a callous appendage extending from the os pubis downwards, according to the testimony of the historians of the Cape of Good Hope. Struys, Gemelli, and other travellers affirm, that in the kingdom of Lambry, in the islands of Formosa, and of Mindoro, men have been found with tails. Bomare says, that a thing of this kind in men is nothing else than an elongation of the os coccygis; but what is a tail in quadrupeds but the elongation of that bone, though divided into distinct articulations? However it may be, it is certain, that that elongation renders those Asiatics fully as irregular as if it was a real tail.

If we were, in like manner, to go through the nations of Asia and Africa, we should hardly find any extensive country where the colour of men is not darker, where there are not stronger irregularities observed, and grosser defects to be found in them, than M. de Paw finds fault with in the Americans. The colour of the latter is a good deal clearer than that of almost all the Africans and the inhabitants of southern Asia. Even their alleged scantiness of beard is common to the inhabitants of the Philippine Islands, and of all the Indian Archipelago, to the famous Chinese, Japanese, Tartars, and many other nations of the Old continent. The imperfections of the Americans, however great they may be represented to be, are certainly not comparable with the defects of that immense people, whose character we have sketched, and others whom we omit.

51 Their constitution and corporal abilities.

M. de Paw represents the Americans to be a feeble and diseased set of nations; and, in order to demonstrate the weakness and disorder of their physical constitution, adduces several proofs equally ridiculous and ill founded, and which it will not be expected we should enumerate. He alleges, among other particulars, that they were overcome in wrestling by all the Europeans, and that they sunk under a moderate burden; that by a computation made, 200,000 Americans were found to have perished in one year from carrying of baggage. With respect to the first point, the Abbé Clavigero observes, it would be necessary that the experiment of wrestling was made between many individuals of each continent, and that the victory should be attested by the Americans as well as the Europeans. It is not, however, meant to insist, that the Americans are stronger than the Europeans. They may be less strong, without the human species having degenerated in them. The Swiss are stronger than the Italians; and still we do not believe the Italians are degenerated, nor do we tax the climate of Italy. The instance of 200,000 Americans having died in one year, under the weight of baggage, were it true, would not convince us so much of the weakness of the Americans, as of the inhumanity of the Europeans. In the same manner that those 200,000 Americans perished, 200,000 Prussians would also have perished, had they been obliged to make a journey of between 300 and 400 miles, with 100 pounds of burden upon their backs; if they had collars of iron about their necks, and were obliged to carry that load over rocks and mountains; if those who became exhausted with fatigue, or wounded their feet so as to impede their progress, had their heads cut off that they might not retard the pace of the rest; and if they were not allowed but a small morsel of bread to enable them to support so severe a toil. Les Casas, from whom M. de Paw got the account of the 200,000 Americans who died under the fatigue of carrying baggage, relates also all the above mentioned circumstances. If that author therefore is to be credited in the last, he is also to be credited in the first. But a philosopher who vaunts the physical and moral qualities of Europeans over those of the Americans, would have done better, we think, to have suppressed facts so opprobrious to the Europeans themselves.

52 Their labour and industry.

Nothing in fact demonstrates so clearly the robustness of the Americans as those various and lasting fatigues in which they are continually engaged. M. de Paw says, that when the New World was discovered, nothing was to be seen but thick woods; that at present there are some lands cultivated, not by the Americans, however, but by the Africans and Europeans; and that the soil in cultivation is to the soil which is uncultivated as 2000 to 2,000,000. These three assertions the Abbé demonstrates to be precisely as many errors. Since the conquest, the Americans alone have been the people who have supported all the fatigues of agriculture in all the vast countries of the continent of South America, and in the greater part of those of South America subject to the crown of Spain. No European is ever to be seen employed in the labours of the field. The Moors who, in comparison of the Americans, are very few in number in the kingdom of New Spain, are charged with the culture of the sugar-cane and tobacco, and the making of sugar; but the soil destined for the cultivation of those plants is not with respect to all the cultivated land of that country in the proportion of one to two thousand. The Americans are the people who labour on the soil. They are the tillers, the sowers, the weeders, and the reapers of the wheat, of the maize, of the rice, of the beans, and other kinds of grain and pulse, of the cacao, of the vanilla, of the cotton, of the indigo, and all other plants useful to the sustenance, the clothing, and commerce of those provinces; and without them so little can be done, that in the year 1762, the harvest of wheat was abandoned in many places on account of a sickness which prevailed and prevented the Indians from reaping it. But this is not all; the Americans are they who cut and transport all the necessary timber from the woods; who cut, transport, and work the stones; who make lime, plaster, and tiles; who construct all the buildings of that kigdom, except a few places

America. places where none of them inhabit; who open and repair all the roads, who make the canals and fluices, and clean the cities. They work in many mines of gold, of filver, of copper, &c. they are the fhepherds, herdfmen, weavers, potters, bafket-makers, bakers, couriers, day-labourers, &c.; in a word, they are the perfons who bear all the burden of public labours. Thefe, fays our juftly indignant author, are the employments of the weak, daftardly, and ufelefs Americans; while the vigorous M. de Paw, and other indefatigable Europeans, are occupied in writing invectives againft them.

53
These a fufficient proof of their healthinefs & ftrength.

Thefe labours, in which the Indians are continually employed, certainly atteft their healthinefs and ftrength; for if they are able to undergo fuch fatigues, they cannot be difeafed, nor have an exhaufted ftream of blood in their veins, as M. de Paw infinuates. In order to make it believed that their conftitutions are vitiated, he copies whatever he finds written by hiftorians of America, whether true or falfe, refpecting the difeafes which reign in fome particular countries of that great continent. It is not to be denied, that in fome countries in the wide compafs of America, men are expofed more than elfewhere to the diftempers which are occafioned by the intemperature of the air, or the pernicious quality of the aliments; but it is certain, according to the affertion of many refpectable authors acquainted with the New World, that the American countries are, for the moft part, healthy; and if the Americans were difpofed to retaliate on M. de Paw, and other European authors who write as he does, they would have abundant fubject of materials to throw difcredit on the clime of the Old continent, and the conftitution of its inhabitants in the endemic diftempers which prevail there.

Laftly, The fuppofed feeblenefs and unfound bodily habit of the Americans do not correfpond with the length of their lives. Among thofe Americans whofe great fatigues and exceffive toils do not anticipate their death, there are not a few who reach the age of 80, 90, and 100 or more years, as formerly mentioned; and what is more, without there being obferved in them that decay which time commonly produces in the hair, in the teeth, in the fkin, and in the mufcles of the human body. This phenomenon, fo much admired by the Spaniards who refide in Mexico, cannot be afcribed to any other caufe than the vigour of their conftitutions, the temperance of their diet, and the falubrity of their clime. Hiftorians, and other perfons who have fojourned there for many years, report the fame thing of other countries of the New World.

54
Their mental qualities.

As to the mental qualities of the Americans, M. de Paw has not been able to difcover any other characters than a memory fo feeble, that to-day they do not remember what they did yefterday; a capacity fo blunt, that they are incapable of thinking, or putting their ideas in order; a difpofition fo cold, that they feel no excitement of love; a daftardly fpirit, and a genius that is torpid and indolent. Many other Europeans, indeed, and what is ftill more wonderful, many of thofe children or defcendants of Europeans who are born in America, think as M. de Paw does; fome from ignorance, fome from want of reflection, and others from hereditary prejudice and prepoffeffion. But all this and more would not be fufficient to invalidate the teftimonies of other Europeans whofe authority have a great deal more weight, both becaufe they were men of great judgment, learning, and knowledge, of thefe countries, and becaufe they gave their teftimony in favour of ftrangers againft their own countrymen. In particular, Acofta, whofe natural and moral hiftory even de Paw commends as *an excellent work*, employs the whole fixth book in demonftrating the good fenfe of the Americans by an explanation of their ancient government, their laws, their hiftories in paintings and knots, calendars, &c. M. de Paw thinks the Americans are beftial; Acofta, on the other hand, reputes thofe perfons weak and prefumptuous who think them fo. M. de Paw fays, that the moft acute Americans were inferior in induftry and fagacity to the rudeft nations of the Old continent; Acofta extols the civil government of the Mexicans above many republics of Europe. M. de Paw finds, in the moral and political conduct of the Americans, nothing but barbarity, extravagance, and brutality; and Acofta finds there, laws that are admirable and worthy of being preferved for ever.

55
M. de Paw's proofs of American cowardice.

M. de Paw denies them courage, and alleges the conqueft of Mexico as a proof of their cowardice. "Cortes (he fays), conquered the empire of Mexico with 450 vagabonds and 15 horfes, badly armed; his miferable artillery confifted of fix falconets, which would not at the prefent day be capable of exciting the fears of a fortrefs defended by invalids. During his abfence the capital was held in awe by the half of his troops. What men! what events!—It is confirmed by the depofitions of all hiftorians, that the Spaniards entered the firft time into Mexico without making one fingle difcharge of their artillery. If the title of hero is applicable to him who has the difgrace to occafion the death of a great number of rational animals, Ferdinand Cortes might pretend to it; otherwife I do not fee what true glory he has acquired by the overthrow of a tottering monarchy, which might have been deftroyed in the fame manner by any other affaffin of our continent."

56
Refuted.

Thefe paffages indicate either M. de Paw's ignorance of the hiftory of the conqueft of Mexico, or a wilful fuppreffion of what would openly contradict his fyftem; fince all who have read that hiftory know well, that the conqueft of Mexico was not made with 450 men, but with more than 200,000. Cortes himfelf, to whom it was of more importance than to M. de Paw to make his bravery confpicuous, and his conqueft appear glorious, confeffes the exceffive number of the allies who were under his command at the fiege of the capital, and combated with more fury againft the Mexicans than the Spaniards themfelves. According to the account which Cortes gave to the emperor Charles V. the fiege of Mexico began with 87 horfes, 848 Spanifh infantry, armed with guns, crofs-bows, fwords, and lances, and upwards of 75,000 allies, of Tlafcala, Huexotzinco, Cholula, and Chalco, equipped with various forts of arms; with three large pieces of cannon of iron, 15 fmall of copper, and 13 brigantines. In the courfe of the fiege were affembled the numerous nations of the Otomies, the Cohuixcas, and Matlazincas, and the troops of the populous cities of the lakes; fo that the army of the befiegers not only exceeded 200,000, but amounted to 4,000,000, according to the letter from Cortes; and befides thefe, 3000 boats and canoes came to their affiftance. Did it betray cowardice to have fuftained,

America. ftained, for full 75 days, the fiege of an open city, engaging daily with an army fo large, and in part provided with arms fo fuperior, and at the fame time having to withftand the ravages of famine? Can they merit the charge of cowardice, who, after having loft feven of the eight parts of their city, and about 50,000 citizens, part cut off by the fword, part by famine and ficknefs, continued to defend themfelves until they were furioufly affaulted in the laft hold which was left them? See the article MEXICO.

57 Remarkable inftance of calumny in M. de Paw. According to M. de Paw, "the Americans at firft "were not believed to be men, but rather fatyrs, or "large apes, which might be murdered without re- "morfe or reproach. At laft, in order to add infult "to the oppreffion of thofe times, a pope made an ori- "ginall bull, in which he declared, that being defirous "of founding bifhoprics in the richeft countries of A- "merica, it pleafed him and the Holy Spirit, to ac- "knowledge the Americans to be true men: in fo "far, that without this decifion of an Italian, the in- "habitants of the New World would have appeared, "even at this day, to the eyes of the faithful, a race "of equivocal men. There is no example of fuch a "decifion fince this globe has been inhabited by men "and apes." Upon this paffage the Abbé animadverts, as being a fingular inftance of calumny and mifreprefentation; and gives the following hiftory of the decifion alluded to.

58 Occafion of the famous bull of Paul III. "Some of the firft Europeans who eftablifhed themfelves in America, not lefs powerful than avaricious, defirous of enriching themfelves to the detriment of the Americans, kept them continually employed, and made ufe of them as flaves; and in order to avoid the reproaches which were made them by the bifhops and miffionaries who inculcated humanity, and the giving liberty to thofe people to get themfelves inftructed in religion, that they might do their duties towards the church and their families, alleged, that the Indians were by nature flaves and incapable of being inftructed; and many other falfehoods of which the Chronicler Herrera makes mention againft them. Thofe zealous ecclefiaftics being unable, either by their authority or preaching, to free thofe unhappy converts from the tyranny of fuch mifers, had recourfe to the Catholic kings, and at laft obtained from their juftice and clemency, thofe laws as favourable to the Americans as honourable to the court of Spain, that compofe the Indian code, which were chiefly due to the indefatigable zeal of the bifhop de las Cafas. On another fide, Garces, bifhop of Tlafcala, knowing that thofe Spaniards bore, notwithftanding their perverfity, a great refpect to the decifions of the vicar of Jefus Chrift, made application in the year 1586 to pope Paul III. by that famous letter, of which we have made mention; reprefenting to him the evils which the Indians fuffered from the wicked Chriftians, and praying him to interpofe his authority in their behalf. The pope, moved by fuch heavy remonftrances, difpatched the next year the original bull, a faithful copy of which we have here fubjoined (A), which was not made, as is manifeft, to declare the Americans true men; for fuch a piece of weaknefs was very diftant from that or any other pope: but folely to fupport the natural rights of the Americans againft the attempts of their oppreffors, and to condemn the injuftice and inhumanity of thofe, who, under the pretence of fuppofing thofe people idolatrous, or incapable of being inftructed, took from them their property and their liberty, and treated them as flaves and beafts.

59 Reprefentation of Columbus. If at firft the Americans were efteemed fatyrs, nobody can better prove it than Chriftopher Columbus their difcoverer. Let us hear, therefore, how that celebrated admiral fpeaks, in his account to the Catholic kings Ferdinand and Ifabella, of the firft fatyrs he faw in the ifland of Haiti, or Hifpaniola. "I fwear," he fays, "to your majefties, that there is not a better people in the world than thefe, more affectionate, affable, or mild. They love their neighbours as themfelves; their language is the fweeteft, the fofteft, and the moft cheerful; for they always fpeak fmiling; and although they go naked, let your majefties believe me, their cuftoms are very becoming; and their king, who is ferved with great majefty, has fuch engaging manners, that it gives great pleafure to fee him, and alfo to confider the

(A) Paulus papa III. univerfis Chrifti Fidelibus prefentes Litteras infpecturis Salutem & Apoftolicam Benedictionem—"Veritas ipfa, quæ nec falli, nec fallere poteft, cum Prædicatores Fidei ad officium prædicationis deftinaret, dixiffe dignofcitur: *Euntes docete omnes gentes:* omnes, dixit, abfque omni delectu, cum omnes Fidei difciplina capaces exiftant. Quod videns & invidens ipfius humani generis æmulus, qui bonis operibus, ut pereant, femper adverfatur, modum excogitavit hactenus inauditum, quo impediret, ne Verbum Dei Gentibus, ut falvæ fierent, prædicaretur: ut quofdam fuos fatellites commovit, qui fuam cupiditatem adimplere cupientes. Occidentales & Meridionales Indos, & alias Gentes, quæ temporibus iftis ad noftram notitiam pervenerunt, fub prætextu quod Fidei Catholicæ expertes exiftant, uti bruta animalia, ad noftra obfequia redigendos effe, paffim afferere præfumant, & eos in fervitutem redigunt tantis afflictionibus illos urgentes, quantis vix bruta animalia illis fervientia urgeant. Nos igitur, qui ejufdem Domini noftri vices, licet indigni, gerimus in terris, & Oves gregis fui nobis commiffas, quæ extra ejus Ovile funt, ad ipfum Ovile toto nixu exquirimus, attendentes Indos ipfos, utpote veros homines, non folum Chriftianæ Fidei capaces exiftere, fed, ut nobis innotuit, ad Fidem ipfam promptiffime currere, ac volentes fuper his congruis remediis providere, prædictos Indos & omnes alias gentes ad notitiam Chriftianorum in pofterum deventuras, licet extra fidem Chrifti exiftant, fua libertate & dominio hujufmodi uti, & potiri, & gaudere libere, & licete poffe, nec in fervitutem redigi debere, ac quicquid fecus fieri contigerit irritum & inane, ipfofque Indos, & alias Gentes Verbi Dei prædicatione, & exemplo bonæ vitæ ad dictam Fidem Chrifti invitandos fore. Auctoritate Apoftolica per præfentes literas decernimus, & declaramus, non obftantibus premiffis, cæterifque contrariis quibufcunque." Datum Romæ anno 1537. IV. Non. Iun. Pontificatus noftri anno III. Quæfta, è non altra è quella famofa bolla, per la quale s' è fatto un fi grande fchiamazzo.

America.

the great retentive faculty of that people, and their desire of knowledge, which incites them to ask the causes and the effects of things."

60
Conclusions concerning the capacities of the Americans.

"We have had intimate commerce with the Americans (continues the Abbé); have lived for some years in a seminary destined for their instruction; saw the erection and progress of the royal college of Guadaloupe founded in Mexico, by a Mexican Jesuit, for the education of Indian children; had afterwards some Indians amongst our pupils; had particular knowledge of many American rectors, many nobles, and numerous artists; attentively observed their character, their genius, their disposition, and manner of thinking; and have examined besides with the utmost diligence their ancient history, their religion, their government, their laws, and their customs. After such long experience and study of them, from which we imagine ourselves enabled to decide without danger of erring, we declare to M. de Paw, and to all Europe, that the mental qualities of the Americans are not in the least inferior to those of the Europeans; that they are capable of all, even the most abstract sciences; and that if equal care was taken of their education, if they were brought up from childhood in seminaries under good masters, were protected and stimulated by rewards, we should see rise among the Americans, philosophers, mathematicians, and divines, who would rival the first in Europe."

61
Their ingenuity, &c. asserted.

But although we should suppose, that, in the torrid climates of the New World, as well as in those of the Old, especially under the additional depression of slavery, there was an inferiority of the mental powers, the Chilese and the North-Americans have discovered higher rudiments of human excellence and ingenuity than have ever been known among tribes in a similar state of society in any part of the world.

M. de Paw affirms, that the Americans were unacqainted with the use of money, and quotes the following well-known passage from Montesquieu: "Imagine to yourself that, by some accident, you are placed in an unknown country; if you find money there, do not doubt that you are arrived among a polished people." But if by money we are to understand a piece of metal with the stamp of the prince or the public, the want of it in a nation is no token of barbarity. The Athenians employed oxen for money, as the Romans did sheep. The Romans had no coined money till the time of Servius Tullius, nor the Persians until the reign of Darius Hystaspes. But if by money is understood a sign representing the value of merchandise, the Mexicans, and other nations of Anahuac, employed money in their commerce. The cacao, of which they made constant use in the market to purchase whatever they wanted, was employed for this purpose, as salt is in Abyssinia.

It has been affirmed, that stone bridges were unknown in America when it was first discovered; and that the natives did not know how to form arches. But these assertions are erroneous. The remains of the ancient palaces of Tezcuco, and still more their vapour baths, show the ancient use of arches and vaults among the Mexicans. But the ignorance of this art would have been no proof of barbarity. Neither the Egyptians nor Babylonians understood the construction of arches.

M. de Paw affirms, that the palace of Montezuma was nothing else than a hut. But it is certain, from the affirmation of all the historians of Mexico, that the army under Cortes, consisting of 6,400 men, were all lodged in the palace; and there remained still sufficient room for Montezuma and his attendants.

62
Tokens of science.

The advances which the Mexicans had made in the study of astronomy is perhaps the most surprising proof of their attention and sagacity: for it appears from Abbé Clavigero's history, that they not only counted 365 days to the year, but also knew of the excess of about six hours in the solar over the civil year, and remedied the difference by means of intercalary days. See ASTRONOMY, n° 5.

63
Specimen of their morality.

Of American morality, the following exhortation of a Mexican to his son may serve as a specimen. "My son, who art come into the light from the womb of thy mother like a chicken from the egg, and like it art preparing to fly through the world, we know not how long Heaven will grant to us the enjoyment of that precious gem which we possess in thee; but however short the period, endeavour to live exactly, praying God continually to assist thee. He created thee: thou art his property. He is thy father, and loves thee still more than I do; repose in him thy thoughts, and day and night direct thy sighs to him. Reverence and salute thy elders, and hold no one in contempt. To the poor and distressed be not dumb, but rather use words of comfort. Honour all persons, particularly thy parents, to whom thou owest obedience, respect, and service. Guard against imitating the example of those wicked sons, who, like brutes that are deprived of reason, neither reverence their parents, listen to their instruction, nor submit to their correction; because whoever follows their steps will have an unhappy end, will die in a desperate or sudden manner, or will be killed and devoured by wild beasts.

"Mock not, my son, the aged or the imperfect. Scorn not him whom you see fall into some folly or transgression, nor make him reproaches; but restrain thyself, and beware lest thou fall into the same error which offends thee in another. Go not where thou art not called, nor interfere in that which does not concern thee. Endeavour to manifest thy good-breeding in all thy words and actions. In conversation, do not lay thy hands upon another, nor speak too much, nor interrupt or disturb another's discourse. When any one discourses with thee, hear him attentively, and hold thyself in an easy attitude, neither playing with thy feet, nor putting thy mantle to thy mouth, nor spitting too often, nor looking about you here and there, nor rising up frequently if thou art sitting; for such actions are indications of levity and low-breeding."—He proceeds to mention several particular vices which are to be avoided, and concludes—"Steal not, nor give thyself to gaming; otherwise thou wilt be a disgrace to thy parents, whom thou oughtest rather to honour for the education they have given thee. If thou wilt be virtuous, thy example will put the wicked to shame. No more, my son; enough hath been said in discharge of the duties of a father. With these counsels I wish to fortify thy mind. Refuse them not, nor act in contradiction to them; for on them thy life, and all thy happiness, depend."

As ranging on the same side with the Abbé Clavigero, the ingenious Mr Jefferson deserves particular at-

America.

attention. This gentleman, in his Notes on the State of Virginia, &c. has taken occaſion to combat the opinions of Buffon; and ſeems to have fully refuted them both by argument and facts. The French philoſopher aſſerts, "That living nature is leſs active, leſs energetic, in the New world than in the Old." He affirms, 1. That the animals common to both continents are ſmaller in America. 2. That thoſe peculiar to the New are on an inferior ſcale. 3. That thoſe which have been domeſticated in both have degenerated in America; and, 4. That it exhibits fewer ſpecies of living creatures. The cauſe of this he aſcribes to the diminution of heat in America, and to the prevalence of humidity from the extenſion of its lakes and waters over a prodigious ſurface. In other words, he affirms that *heat* is friendly, and *moiſture* adverſe, to the production and developement of the larger quadrupeds.

64 Notions of M. de Buffon concerning the degeneracy of animal nature in America.

65 The hypotheſis that moiſture is unfriendly to animal growth, conſidered.

The hypotheſis that moiſture is unfriendly to animal growth, Mr Jefferſon ſhows to be contradicted by obſervation and experience. It is by the aſſiſtance of heat and moiſture that vegetables are elaborated from the elements. Accordingly we find that the more humid climates produce plants in greater profuſion than the dry. Vegetables are immediately or remotely the food of every animal; and, from the uniform operation of nature's laws we diſcern, that, in proportion to the quantity of food, animals are not only multiplied in their numbers, but improved in their ſize. Of this laſt opinion is the Count de Buffon himſelf in another part of his work: "En general, il paroit que les pays un peu *froids* conviennent mieux à nos bœufs que les pays chauds, et qu'ils ſont d'autant plus gros et plus grands que le climat eſt plus *humide* et plus abondans en paturages. Les bœufs de Danemarck, de la Podolie, de l'Ukraine, et de la Tartarie qu'habitent les Calmouques, ſont les plus grands de tous." Here then a race of animals, and one of the largeſt too, has been increaſed in its dimenſions by cold and moiſture, in direct oppoſition to the hypotheſis, which ſuppoſes that theſe two circumſtances diminiſh animal bulk, and that it is their contraries, heat and dryneſs, which enlarge it. But to try the queſtion on more general ground, let us take two portions of the earth, Europe and America for inſtance, ſufficiently extenſive to give operation to general cauſes; let us conſider the circumſtances peculiar to each, and obſerve their effect on animal nature. America, running through the torrid as well as temperate zone, has more heat, collectively taken, than Europe. But Europe, according to our hypotheſis, is the drieſt. They are equally adapted then to animal productions; each being endowed with one of thoſe cauſes which befriend animal growth, and with one which oppoſes it. Let us then take a comparative view of the quadrupeds of Europe and America, preſenting them to the eye in three different tables; in one of which ſhall be enumerated thoſe found in both countries; in a ſecond, thoſe found in one only; in a third, thoſe which have been domeſticated in both. To facilitate the compariſon, let thoſe of each table be arranged in gradation according to their ſizes, from the greateſt to the ſmalleſt, ſo far as their ſizes can be conjectured. The weights of the large animals ſhall be expreſſed in the Engliſh avoirdupoiſe pound and its decimals; thoſe of the ſmaller in the ounce and its decimals. Thoſe which are marked thus *, are actual weights of particular ſubjects, deemed among the largeſt of their ſpecies. Thoſe marked thus †, are furniſhed by judicious perſons, well acquainted with the ſpecies, and ſaying, from conjecture only, what the largeſt individual they had ſeen would probably have weighed. The other weights are taken from Meſſrs Buffon and D'Aubenton, and are of ſuch ſubjects as came caſually to their hands for diſſection.

66 The contrary maintained by Mr Jefferſon,

America.

"Comparative View of the Quadrupeds of Europe and of America.

Table I. *Aboriginals of both.*	Europe.	America.
	lb.	lb.
Mammoth		
Buffalo. Biſon		*1800
White bear. Ours blanc		
Caribou. Renne		
Bear. Ours	153.7	*410
Elk. Elan. Original, palmated		
Red deer. Cerf	288.8	*273
Fallow deer. Daim	167.8	
Wolf. Loup	69.8	
Roe. Chevreuil	56.7	
Glutton. Glouton. Carcajou		
Wild cat. Chat ſauvage		†30
Lynx. Loup cervier	25.	
Beaver. Caſtor	18.5	*45
Badger. Blaireau	13.6	
Red fox. Renard	13.5	
Grey fox. Iſatis		
Otter. Loutre	8.9	†12
Monax. Marmotte	6.5	
Viſon. Fouine	2.8	
Hedgehog. Heriſſon	2.2	
Martin. Marte	1.9	†6
	oz.	
Water rat. Rat d'eau	7.5	
Weſel. Belette	2.2	oz.
Flying ſquirrel. Polatouche	2.2	†4
Shrew mouſe. Muſaraigne	1.	

Table II. *Aboriginals of one only.*

EUROPE.	lb.	AMERICA.	lb.
Sanglier. Wild boar	280.	Tapir	534.
Mouflon. Wild ſheep	56.	Elk, round horned	†450.
Bouquetin. Wild goat		Puma	
Lievre. Hare	7.6	Jaguar	218.
Lapin. Rabbit	3.4	Cabiai	109.
Putois. Polecat	3.3	Tamanoir	109.
Genette	3.1	Tamandua	65.4
Deſman. Muſkrat	oz.	Cougar of N. Amer.	75.
Ecureuil. Squirrel	12.	Cougar of S. Amer.	59.4
Hermine. Ermin	8.2	Ocelot	
Rat. Rat	7.5	Pecari	46.3
Loirs	3.1	Jaguaret	43.6
Lerot. Dormouſe	1.8	Alco	
Taupe. Mole	1.2	Lama	
Hamſter	.9	Paco	
Ziſel		Paca	32.7
Leming		Serval	
Souris. Mouſe	.6	Sloth. Unau	27¼

America.

Table II. continued.

EUROPE.	AMERICA.	
		lb.
	Saricovienne	
	Kincajou	
	Tatou Kabaffou	21.8
	Urfon. Urchin	
	Raccoon. Raton	16.5
	Coati	
	Coendou	16.3
	Sloth. Aï	13.
	Sapajou Ouarini	
	Sapajou Coaita	9.8
	Tatou Encubert	
	Tatou Apar	
	Tatou Cachica	7.
	Little Coendou	6.5
	Opoffum. Sarigue	
	Tapeti	
	Margay	
	Crabier	
	Agouti	4.2
	Sapajou Saï	3.5
	Tatou Cirquinçon	
	Tatou Tatouate	3.3
	Mouffette Squafh	
	Mouffette Chinche	
	Mouffette Conepate. Scunk	
	Mouffette. Zorilla	
	Whabus. Hare. Rabbit	
	Aperea	
	Akouchi	
	Ondatra. Mufkrat	
	Pilori	
	Great grey fquirrel	†2.7
	Fox fquirrel of Virginia	†2.625
	Surikate	2.
	Mink	†2.
	Sapajou. Sajou	1.8
	Indian pig. Cochon d'Inde	1.6
	Sapajou. Saïmiri	1.5
	Phalanger	
	Coquallin	
	Leffer grey fquirrel	†1.5
	Black fquirrel	†1.5
	Red fquirrel	10. oz.
	Sagoin Saki	
	Sagoin Pinche	
	Sagoin Tamarin	oz.
	Sagoin Ouiftiti	4.4
	Sagoin Marikine	
	Sagoin Mico	
	Cayopollin	
	Fourmillier	
	Marmofe	
	Sarigue of Cayenne	
	Tucan	
	Red mole	oz.
	Ground fquirrel	4.

America.

TABLE III. *Domefticated in both.*

	Europe.	America.
	lb.	lb.
Cow	763.	*2500
Horfe		*1366
Afs		
Hog		*1200
Sheep		*125
Goat		*80
Dog	67.6	
Cat	7.	

67 Refult of the firft table.

"The refult of this view is, that of 26 quadrupeds common to both countries, feven are faid to be larger in America, feven of equal fize, and 12 not fufficiently examined. So that the firft table impeaches the firft member of the affertion, that of the animals common to both countries the American are fmalleft, "Et cela fans aucune exception." It fhows it not juft, in all the latitude in which its author has advanced it, and probably not to fuch a degree as to found a diftinction between the two countries.

68 Explanation and refult of the fecond table.

"Proceeding to the fecond table, which arranges the animals found in one of the two countries only, M. de Buffon obferves, that the taphir, the elephant of America, is but of the fize of a fmall cow. To preferve our comparifon, Mr Jefferfon ftates the wild boar, the elephant of Europe, as little more than half that fize. He has made an elk with round or cylindrical horns, an animal of America, and peculiar to it; becaufe he has feen many of them himfelf, and more of their horns; and becaufe, from the beft information, it is certain that in Virginia this kind of elk has abounded much, and ftill exifts in fmaller numbers. He makes the American hare or rabbit peculiar, believing it to be different from both the European animals of thofe denominations, and calling it therefore by its Algonquin name Whabus, to keep it diftinct from thefe. Kalm is of the fame opinion. The fquirrels are denominated from a knowledge derived from daily fight of them, becaufe with that the European appellations and defcriptions feem irreconcileable. Thefe are the only inftances in which Mr Jefferfon departs from the authority of M. de Buffon in the conftruction of this table; whom he takes for his ground-work, becaufe he thinks him the beft informed of any naturalift who has ever written. The refult is, that there are 18 quadrupeds peculiar to Europe; more than four times as many, to wit 74, peculiar to America; that the firft of thefe 74, the tapir, the largeft of the animals peculiar to America, weighs more than the whole column of Europeans; and confequently this fecond table difproves the fecond member of the affertion, that the animals peculiar to the New World are on a fmaller fcale, fo far as that affertion relied on European animals for fupport: and it is in full oppofition to the theory which makes the animal volume to depend on the circumftances of heat and moifture.

69 Of the third table.

"The third table comprehends thofe quadrupeds only which are domeftic in both countries. That fome of thefe, in fome parts of America, have become lefs than their original ftock, is doubtlefs true; and the reafon is very obvious. In a thinly-peopled country, the

America.

the ſpontaneous productions of the foreſts and waſte fields are ſufficient to ſupport indifferently the domeſtic animals of the farmer, with a very little aid from him in the ſevereſt and ſcarceſt ſeaſon. He therefore finds it more convenient to receive them from the hand of nature in that indifferent ſtate, than to keep up their ſize by a care and nouriſhment which would coſt him much labour. If, on this low fare, theſe animals dwindle, it is no more than they do in thoſe parts of Europe where the poverty of the ſoil, or poverty of the owner, reduces them to the ſame ſcanty ſubſiſtence. It is the uniform effect of one and the ſame cauſe, whether acting on this or that ſide of the globe. It would be erring therefore againſt that rule of philoſophy, which teaches us to aſcribe like effects to like cauſes, ſhould we impute this diminution of ſize in America to any imbecillity or want of uniformity in the operations of nature. It may be affirmed with truth, that in thoſe countries, and with thoſe individuals of America, where neceſſity or curioſity has produced equal attention as in Europe to the nouriſhment of animals, the horſes, cattle, ſheep, and hogs of the one continent are as large as thoſe of the other. There are particular inſtances, well atteſted, where individuals of America have imported good breeders from England, and have improved their ſize by care in the courſe of ſome years. And the weights actually known and ſtated in the third table, will ſuffice to ſhow, that we may conclude, on probable grounds, that, with equal food and care, the climate of America will preſerve the races of domeſtic animals as large as the European ſtock from which they are derived; and conſequently that the third member of Monſ. de Buffon's aſſertion, that the domeſtic animals are ſubject to degeneration from the climate of America, is as probably wrong as the firſt and ſecond were certainly ſo.

That the laſt part of it is erroneous, which affirms, that the ſpecies of American quadrupeds are comparatively few, is evident from the tables taken altogether; to which may be added the proof adduced by the Abbé Clavigero. According to Buffon's lateſt calculation, in his *Epoches de la Nature*, there are 300 ſpecies of quadrupeds; and America, though it does not make more than a third part of the globe, contains, according to Clavigero, almoſt one half of the different ſpecies of its animals.

70
The human inhabitants comprehended in the ſame hypotheſis of degeneracy.

Of the human inhabitants of America, to whom the ſame hypotheſis of degeneracy is extended, M. Buffon gives the following deſcription: "Though the American ſavage be nearly of the ſame ſtature with men in poliſhed ſocieties; yet this is not a ſufficient exception to the general contraction of animated Nature throughout the whole continent. In the ſavage, the organs of generation are ſmall and feeble. He has no hair, no beard, no ardour for the female. Though nimbler than the European, becauſe more accuſtomed to running, his ſtrength is not ſo great. His ſenſations are leſs acute; and yet he is more timid and cowardly. He has no vivacity, no activity of mind. The activity of his body is not ſo much an exerciſe or ſpontaneous motion, as a neceſſary action produced by want. Deſtroy his appetite for victuals and drink, and you will at once annihilate the active principle of all his movements: He remains in ſtupid repoſe, on his limbs or couch, for whole days. It is eaſy to diſcover the cauſe of the ſcattered life of ſavages, and of their eſtrangement from ſociety. They have been refuſed the moſt precious ſpark of Nature's fire: They have no ardour for women, and, of courſe, no love to mankind. Unacquainted with the moſt lively and moſt tender of all attachments, their other ſenſations of this nature are cold and languid. Their love to parents and children is extremely weak. The bonds of the moſt intimate of all ſocieties, that of the ſame family, are feeble; and one family has no attachment to another. Hence no union, no republic, no ſocial ſtate, can take place among them. The phyſical cauſe of love gives riſe to the morality of their manners. Their heart is frozen, their ſociety cold, and their empire cruel. They regard their females as ſervants deſtined to labour, or as beaſts of burden, whom they load unmercifully with the produce of their hunting, and oblige, without pity or gratitude, to perform labours which often exceed their ſtrength. They have few children, and pay little attention to them. Every thing muſt be referred to the firſt cauſe: They are indifferent, becauſe they are weak; and this indifference to the ſex is the original ſtain which diſgraces Nature, prevents her from expanding, and, by deſtroying the germs of life, cuts the root of ſociety. Hence man makes no exception to what has been advanced. Nature, by denying him the faculty of love, has abuſed and contracted him more than any other animal."

71
Obſervations by Mr Jefferſon.

A humiliating picture, indeed! but than which, Mr Jefferſon aſſures us, never was one more unlike the original. M. Buffon grants, that their ſtature is the ſame as that of the men of Europe, and he might have admitted, that the Iroquois were larger, and the Lenopi or Delawares taller, than people in Europe generally are: But he ſays their organs of generation are ſmaller and weaker than thoſe of Europeans: which is not a fact. And as to their want of beard, this error has been already noticed (n° 49. *ſupra*).

72
Seeming coldneſs of the Americans to the ſex accounted for.

"They have no ardour for their female."—It is true, they do not indulge thoſe exceſſes, nor diſcover that fondneſs, which are cuſtomary in Europe; but this is not owing to a defect in nature, but to manners. Their ſoul is wholly bent upon war. This is what procures them glory among the men, and makes them the admiration of the women. To this they are educated from their earlieſt youth. When they purſue game with ardour, when they bear the fatigues of the chace, when they ſuſtain and ſuffer patiently hunger and cold; it is not ſo much for the ſake of the game they purſue, as to convince their parents and the council of the nation, that they are fit to be enrolled in the number of the warriors. The ſongs of the women, the dance of the warriors, the ſage counſel of the chiefs, the tales of the old, the triumphal entry of the warriors returning with ſucceſs from battle, and the reſpect paid to thoſe who diſtinguiſh themſelves in battle, and in ſubduing their enemies; in ſhort, every thing they ſee or hear, tends to inſpire them with an ardent deſire for military fame. If a young man were to diſcover a fondneſs for women before he has been to war, he would become the contempt of the men, and the ſcorn and ridicule of the women: or were he to indulge himſelf with a captive taken in war, and much more were he to offer violence in order to gratify his luſt, he would incur indelible diſgrace. The ſeeming frigidity

America. dity of the men, therefore, is the effect of manners, and not a defect of nature. They are neither more defective in ardour, nor more impotent with the female, than are the whites reduced to the same diet and exercise.

73
Why they have few children.

"They raise few children."—They indeed raise fewer children than we do; the causes of which are to be found, not in a difference of nature, but of circumstance. The women very frequently attending the men in their parties of war and of hunting, childbearing becomes extremely inconvenient to them. It is said, therefore, that they have learned the practice of procuring abortion by the use of some vegetable; and that it even extends to prevent conception for a considerable time after. During these parties they are exposed to numerous hazards, to excessive exertions, to the greatest extremities of hunger. Even at their homes, the nation depends for food, through a certain part of every year, on the gleanings of the forest; that is, they experience a famine once in every year. With all animals, if the female be badly fed, or not fed at all, her young perish; and if both male and female be reduced to like want, generation becomes less active, less productive. To the obstacles, then, of want and hazard, which nature has opposed to the multiplication of wild animals, for the purpose of restraining their numbers within certain bounds, those of labour and of voluntary abortion are added with the Indian. No wonder, then, if they multiply less than we do. Where food is regularly supplied, a single farm will show more of cattle than a whole country of forests can of buffaloes. The same Indian women, when married to white traders, who feed them and their children plentifully and regularly, who exempt them from excessive drudgery, who keep them stationary and unexposed to accident, produce and raise as many children as the white women. Instances are known, under these circumstances, of their rearing a dozen children.

74
Of their sensibility, &c.

Neither do they seem to be "deficient in natural affection." On the contrary, their sensibility is keen, even the warriors weeping most bitterly on the loss of their children; though in general they endeavour to appear superior to human events.

Their friendships are strong, and faithful to the uttermost extremity. A remarkable instance of this appeared in the case of the late Col. Byrd, who was sent to the Cherokee nation to transact some business with them. It happened that some of our disorderly people had just killed one or two of that nation. It was therefore proposed in the council of the Cherokees, that Col. Byrd should be put to death in revenge for the loss of their countrymen. Among them was a chief called *Silòuee*, who, on some former occasion, had contracted an acquaintance and friendship with Col. Byrd. He came to him every night in his tent, and told him not to be afraid, they should not kill him. After many days deliberation, however, the determination was, contrary to Silòuee's expectation, that Byrd should be put to death, and some warriors were dispatched as executioners. Silòuee attended them; and when they entered the tent, he threw himself between them and Byrd, and said to the warriors, "This man is my friend: before you get at him, you must kill me." On which they returned; and the council respected the principle so much as to recede from their determination. America.

That "they are timorous and cowardly" is a character with which there is little reason to charge them, when we recollect the manner in which the Iroquois met Monf. ———, who marched into their country; in which the old men, who scorned to fly, or to survive the capture of their town, braved death like the old Romans in the time of the Gauls, and in which they soon after revenged themselves by sacking and destroying Montreal. In short, the Indian is brave, when an enterprise depends on bravery; education with him making the point of honour consist in the destruction of an enemy by stratagem, and in the preservation of his own person free from injury: or perhaps this is nature, while it is education which teaches us to honour force more than finesse. He will defend himself against an host of enemies, always choosing to be killed rather than to surrender, though it be to the whites, who he knows will treat him well. In other situations, also, he meets death with more deliberation; and endures tortures with a firmness unknown almost to religious enthusiasm among us.

75
Of their courage. (See also n° 54, 55, *supra*.)

Much less are they to be characterised as a people of no vivacity, and who are excited to action or motion only by the calls of hunger and thirst. Their dances, in which they so much delight, and which to a European would be the most severe exercise, fully contradict this; not to mention their fatiguing marches, and the toil they voluntarily and cheerfully undergo in their military expeditions. It is true, that when at home they do not employ themselves in labour or the culture of the soil: but this, again, is the effect of customs and manners which have assigned that to the province of the women. But it is said, "they are averse to society and a social life." Can any thing be more inapplicable than this to a people who always live in towns or in clans? Or can they be said to have no *republique*, who conduct all their affairs in national councils; who pride themselves in their national character; who consider an insult or injury done to an individual by a stranger as done to the whole, and resent it accordingly?

To form a just estimate of their genius and mental powers, Mr Jefferson observes, more facts are wanting, and great allowance is to be made for those circumstances of their situation which call for a display of particular talents only. This done, we shall probably find that the Americans are formed, in mind as well as in body, on the same model with the *homo sapiens Europæus*. The principles of their society forbidding all compulsion, they are to be led to duty and to enterprise by personal influence and persuasion. Hence eloquence in council, bravery and address in war, become the foundations of all consequence with them. To these acquirements all their faculties are directed. Of their bravery and address in war we have multiplied proofs, because we have been the subjects on which they were exercised. Of their eminence in oratory we have fewer examples, because it is displayed chiefly in their own councils. Some, however, we have of very superior lustre. We may challenge the whole orations of Demosthenes and Cicero, and of any more eminent orator, if Europe has furnished more eminent, to produce a single passage superior to the speech

ſpeech of Logan, a Mingo chief, to Lord Dunmore when governor of this ſtate. The ſtory is as follows; of which, and of the ſpeech, the authenticity is unqueſtionable.

76 Story of Logan.

In the ſpring of the year 1774, a robbery and murder were committed on an inhabitant of the frontiers of Virginia by two Indians of the Shawanee tribe. The neighbouring whites, according to their cuſtom, undertook to puniſh this outrage in a ſummary way. Colonel Creſap, a man infamous for the many murders he had committed on thoſe much-injured people, collected a party, and proceeded down the Kanhaway in queſt of vengeance. Unfortunately a canoe of women and children, with one man only, was ſeen coming from the oppoſite ſhore, unarmed, and unſuſpecting any hoſtile attack from the whites. Creſap and his party concealed themſelves on the bank of the river; and the moment the canoe reached the ſhore, ſingled out their objects, and at one fire killed every perſon in it. This happened to be the family of Logan, who had long been diſtinguiſhed as a friend of the whites. This unworthy return provoked his vengeance. He accordingly ſignalized himſelf in the war which enſued. In the autumn of the ſame year a deciſive battle was fought at the mouth of the Great Kanhaway, between the collected forces of the Shawanees, Mingoes, and Delawares, and a detachment of the Virginia militia. The Indians were defeated, and ſued for peace. Logan, however, diſdained to be ſeen among the ſuppliants; but, leſt the ſincerity of a treaty ſhould be diſtruſted from which ſo diſtinguiſhed a chief abſented himſelf, he ſent by a meſſenger the following ſpeech, to be delivered to Lord Dunmore:—

77 Specimen of Indian eloquence

"I appeal to any white man to ſay if ever he entered Logan's cabin hungry, and he gave him not meat; if ever he came cold and naked, and he clothed him not. During the courſe of the laſt long and bloody war, Logan remained idle in his cabin, an advocate for peace. Such was my lov for the whites, that my countrymen pointed as they paſſed, and ſaid, *Logan is the friend of white men.* I had even thought to have lived with you, but for the injuries of one man. Colonel Creſap, the laſt ſpring, in cold blood, and unprovoked, murdered all the relations of Logan, not ſparing even my women and children. There runs not a drop of my blood in the veins of any living creature. This called on me for revenge. I have ſought it; I have killed many; I have fully glutted my vengeance. For my country, I rejoice at the beams of peace; but do not harbour a thought that mine is the joy of fear. Logan never felt fear. He will not turn on his heel to ſave his life. Who is there to mourn for Logan? Not one."

78 Other anecdotes.

To the preceding anecdotes in favour of the American character, may be added the following by Dr Benjamin Franklin. The Indian men, when young, are hunters and warriors; when old, counſellors; for all their government is by the counſel or advice of the ſages. Hence they generally ſtudy oratory; the beſt ſpeaker having the moſt influence. The Indian women till the ground, dreſs the food, nurſe and bring up the children, and preſerve and hand down to poſterity the memory of public tranſactions. Theſe employments of men and women are accounted natural and honourable. Having few artificial wants, they have abundance of leiſure for improvement by converſation. Our laborious manner of life, compared with theirs, they eſteem ſlaviſh and baſe; and the learning on which we value ourſelves, they regard as frivolous and uſeleſs.

Having frequent occaſions to hold public councils, they have acquired great order and decency in conducting them. The old men ſit in the foremoſt ranks, the warriors in the next, and the women and children in the hindmoſt. The buſineſs of the women is to take exact notice of what paſſes; imprint it in their memories, for they have no writing, and communicate it to their children. They are the records of the council, and they preſerve tradition of the ſtipulations in treaties a hundred years back; which, when we compare with our writings, we always find exact. He that would ſpeak riſes. The reſt obſerve a profound ſilence. When he has finiſhed, and ſits down, they leave him five or ſix minutes to recollect, that if he has omitted any thing he intended to ſay, or has any thing to add, he may riſe again and deliver it. To interrupt another, even in common converſation, is reckoned highly indecent.

79 Politeneſs and civility of the American Indians.

The politeneſs of theſe ſavages in converſation is, indeed, carried to exceſs; ſince it does not permit them to contradict or deny the truth of what is aſſerted in their preſence. By this means they indeed avoid diſputes; but then it becomes difficult to know their minds, or what impreſſion you make upon them. The miſſionaries who have attempted to convert them to Chriſtianity, all complain of this as one of the great difficulties of their miſſion. The Indians hear with patience the truths of the goſpel explained to them, and give their uſual tokens of aſſent and approbation; but this by no means implies conviction; it is mere civility.

When any of them come into our towns, our people are apt to croud round them, gaze upon them, and incommode them where they deſire to be private; this they eſteem great rudeneſs, and the effect of the want of inſtruction in the rules of civility and good manners. "We have," ſay they, "as much curioſity as you; and when you come into our towns, we wiſh for opportunities of looking at you; but for this purpoſe we hide ourſelves behind buſhes where you are to paſs, and never intrude ourſelves into your company."

80 Their hoſpitality.

Their manner of entering one another's villages has likewiſe its rules. It is reckoned uncivil in travelling ſtrangers to enter a village abruptly, without giving notice of their approach. Therefore, as ſoon as they arrive within hearing, they ſtop and hollow, remaining there till invited to enter. Two old men uſually come out to them and lead them in. There is in every village a vacant dwelling, called the *ſtrangers houſe.* Here they are placed, while the old men go round from hut to hut, acquainting the inhabitants that ſtrangers are arrived, who are probably hungry and weary; and every one ſends them what he can ſpare of victuals, and ſkins to repoſe on. When the ſtrangers are refreſhed, pipes and tobacco are brought; and then, but not before, converſation begins, with inquiries who they are, whither bound, what news, &c. and it uſually ends with offers of ſervice: if the ſtrangers have occaſion for guides, or any neceſſaries for continuing their journey; and nothing is exacted for the entertainment.

The ſame hoſpitality, eſteemed among them as a principal virtue, is practiſed by private perſons; of which Conrad Weiſer, our interpreter, gave Dr Franklin the following inſtance: He had been naturalized

America.

among the Six Nations, and ſpoke well the Mohock language. In going through the Indian country to carry a meſſage from our governor to the council at Onondaga, he called at the habitation of Canaſſetego, an old acquaintance, who embraced him, ſpread furs for him to ſit on, placed before him ſome boiled beans and veniſon, and mixed ſome rum and water for his drink. When he was well refreſhed, and had lit his pipe, Canaſſetego began to converſe with him: aſked how he had fared the many years ſince they had ſeen each other, whence he then came, what had occaſioned the journey, &c. Conrad anſwered all his queſtions; and when the diſcourſe began to flag, the Indian, to continue it, ſaid, "Conrad, you have lived long among the white people, and know ſomething of their cuſtoms; I have been ſometimes at Albany, and have obſerved, that once in ſeven days they ſhut up their ſhops, and aſſemble all in the great houſe; tell me what it is for?—What do they do there?" "They meet there," ſays Conrad, "to hear and learn *good things*." "I do not doubt," ſays the Indian, "that they tell you ſo; they have told me the ſame: but I doubt the truth of what they ſay, and I will tell you my reaſons. I went lately to Albany to ſell my ſkins, and buy blankets, knives, powder, rum, &c. You know I generally uſed to deal with Hans Hanſon; but I was a little inclined this time to try ſome other merchants. However, I called firſt upon Hans, and aſked him what he would give for beaver. He ſaid he could not give more than 4s. a pound; but (ſays he) I cannot talk on buſineſs now; this is the day when we meet together to learn *good things*, and I am going to the meeting. So I thought to myſelf, ſince I cannot do any buſineſs to-day, I may as well go to the meeting too; and I went with him. —There ſtood up a man in black, and began to talk to the people very angrily. I did not underſtand what he ſaid; but perceiving that he looked much at me and at Hanſon, I imagined he was angry at ſeeing me there: ſo I went out, ſat down near the houſe, ſtruck fire, and lit my pipe, waiting till the meeting ſhould break up. I thought too, that the man had mentioned ſomething of beaver, and I ſuſpected that it might be the ſubject of their meeting. So when they came out, I accoſted my merchant.—Well, Hans, (ſays I,) I hope you have agreed to give more than 4s. a pound?" "No, (ſays he), I cannot give ſo much, I cannot give more than 3s. 6d." "I then ſpoke to ſeveral other dealers, but they all ſung the ſame ſong, three and ſixpence, three and ſixpence. This made it clear to me that my ſuſpicion was right; and that whatever they pretended of meeting to learn *good things*, the real purpoſe was, to conſult how to cheat Indians in the price of beaver. Conſider but a little, Conrad, and you muſt be of my opinion. If they met ſo often to learn *good things*, they certainly would have learned ſome before this time. But they are ſtill ignorant. You know our practice. If a white man, in travelling through our country, enters one of our cabins, we all treat him as I treat you; we dry him if he is wet, we warm him if he is cold, and give him meat and drink, that he may allay his thirſt and hunger; and we ſpread ſoft furs for him to reſt and ſleep on: we demand nothing in return. But if I go into a white man's houſe at Albany, and aſk for victuals and drink, they ſay, Where is your money? And if I have none, they ſay, Get out, you Indian dog. You ſee they have not yet learned thoſe little *good things* that we need no meeting to be inſtructed in; becauſe our mothers taught them to us when we were children; and therefore it is impoſſible there meetings ſhould be, as they ſay, for any ſuch purpoſe, or have any ſuch effect; they are only to contrive *the cheating of Indians in the price of beaver*."

The next queſtion that occurs is, Whether the peculiarities of the Americans, or the diſparity between them and the inhabitants of Europe, afford ſufficient grounds for determining them, as ſome have done, to be a race of men radically different from all others?

In this queſtion, to avoid being tedious, we ſhall confine ourſelves to what has been advanced by Lord Kames; who is of opinion, that there are many different ſpecies of men, as well as of other animals; and gives an hypotheſis, whereby he pretends his opinion may be maintained in a conſiſtency with Revelation. 81

Lord Kames's arguments for different ſpecies.

"If (ſays he) the only rule afforded by nature for claſſing animals can be depended on, there are different races of men as well as of dogs: a maſtiff differs not more from a ſpaniel, than a white man from a negro, or a Laplander from a Dane. And, if we have any faith in Providence, it ought to be ſo. Plants were created of different kinds, to fit them for different climates; and ſo were brute animals. Certain it is, that all men are not fitted equally for every climate. There is ſcarce a climate but what is natural to ſome men, where they proſper and flouriſh; and there is not a climate but where ſome men degenerate. Doth not then analogy lead us to conclude, that, as there are different climates on the face of this globe, ſo there are different races of men fitted for theſe different climates?

"M. Buffon, from the rule, That animals which can procreate together, and whoſe progeny can alſo procreate, are of one ſpecies; concludes, that all men are of one race or ſpecies; and endeavours to ſupport that favourite opinion, by aſcribing to the climate, to food, or to other accidental cauſes, all the varieties that are found among men. But is he ſeriouſly of opinion, that any operation of climate, or of other accidental cauſe, can account for the copper colour and ſmooth chin univerſal among the Americans; the prominence of the pudenda univerſal among the Hottentot women, or the black nipple no leſs univerſal among the female Samoiedes?—It is in vain to aſcribe to the climate, the low ſtature of the Eſquimaux, the ſmallneſs of their feet, or the overgrown ſize of their heads. It is equally in vain to aſcribe to climate the low ſtature of the Laplanders, or their ugly viſage. The black colour of negroes, thick lips, flat noſe, criſped woolly hair, and rank ſmell, diſtinguiſh them from every other race of men. The Abyſſinians, on the contrary, are tall and well made, their complexion a brown olive, features well-proportioned, eyes large and of a ſparkling black, thin lips, a noſe rather high than flat. There is no ſuch difference of climate between Abyſſinia and Negro-land as to produce theſe ſtriking differences.

"Nor ſhall our author's ingenious hypotheſis concerning the extremities of heat and cold, purchaſe him impunity with reſpect to the ſallow complexion of the Samoiedes, Laplanders, and Greenlanders. The Finlanders, and northern Norwegians, live in a climate not leſs cold than that of the people mentioned; and yet are fair beyond other Europeans. I ſay more, there are many inſtances of races of people preſerving their

America. their original colour, in climates very different from their own; but not a single instance of the contrary, as far as I can learn. There have been four complete generations of negroes in Pensylvania, without any visible change of colour; they continue jet black, as originally. Those who ascribe all to the sun, ought to consider how little probable it is, that the colour it impresses on the parents should be communicated to their infant children, who never saw the sun: I should be as soon induced to believe with a German naturalist, whose name has escaped me, that the negro colour is owing to an ancient custom in Africa, of dyeing the skin black. Let a European, for years, expose himself to the sun in a hot climate, till he be quite brown; his children will nevertheless have the same complexion with those in Europe. From the action of the sun, is it possible to explain, why a negro, like a European, is born with a ruddy skin, which turns jet black the eighth or ninth day?"

Our author next proceeds to draw some arguments for the existence of different races of men, from the various tempers and dispositions of different nations; which he reckons to be *specific* differences, as well as those of colour, stature, &c. and having summed up his evidence, he concludes thus: "Upon summing up the whole particulars mentioned above, would one hesitate a moment to adopt the following opinion, were there no counterbalancing evidence, viz. 'That God created many pairs of the human race, differing from each other, both externally and internally; that he fitted those pairs for different climates, and placed each pair in its proper climate; that the peculiarities of the original pairs were preserved entire in their descendants; who, having no assistance but their natural talents, were left to gather knowledge from experience; and, in particular, were left (each tribe) to form a language for itself; that signs were sufficient for the original pairs, without any language but what nature suggests; and that a language was formed gradually, as a tribe increased in numbers, and in different occupations, to make speech necessary?" But this opinion, however plausible, we are not permitted to adopt; being taught a different lesson by Revelation, viz. That God created but a single pair of the human species. Though we cannot doubt the authority of Moses, yet his account of the creation of man is not a little puzzling, as it seems to contradict every one of the facts mentioned above. According to that account, different races of men were not formed, nor were men formed originally for different climates. All men must have spoken the same language, viz. That of our first parents. And what of all seems the most contradictory to that account, is the savage state: Adam, as Moses informs us, was endued by his Maker with an eminent degree of knowledge; and he certainly was an excellent preceptor to his children and their progeny, among whom he lived many generations. Whence then the degeneracy of all men unto the savage state? To account for that dismal catastrophe, mankind must have suffered some terrible convulsion. That terrible convulsion is revealed to us in the history of the tower of Babel, contained in the 11th chapter of Genesis, which is, 'That, for many centuries after the deluge, the whole earth was of one language, and of one speech; that they united to build a city on a plain in the land of Shinar, with a tower, whose top might reach unto heaven; that the Lord, beholding the people to be one, and to have all one language, and that nothing would be restrained from them which they imagined to do, confounded their language that they might not understand one another, and scattered them abroad upon the face of all the earth.' Here light breaks forth in the midst of darkness. By confounding the language of men, and scattering them abroad upon the face of all the earth, they were rendered savages. And to harden them for their new habitations, it was necessary that they should be divided into different kinds, fitted for different climates. Without an immediate change of constitution, the builders of Babel could not possibly have subsisted in the burning region of Guinea, nor in the frozen region of Lapland; houses not being prepared, nor any other convenience to protect them against a destructive climate."

82
His hypothesis concerning the origin of the different species.

83
Incomplete.

We may first remark, on his Lordship's hypothesis, that it is evidently incomplete: for, allowing the human race to have been divided into different species at the confusion of languages, and that each species was adapted to a particular climate; by what means were they to get to the climates proper for them, or how were they to know that such climates existed? How was an American, for instance, when languishing in an improper climate at Babel, to get to the land of the Amazons, or the banks of the Oroonoko, in his own country? or how was he to know that these places were more proper for him than others?—If, indeed, we take the scripture phrase, "The Lord *scattered them abroad* upon the face of all the earth," in a certain sense, we may account for it. If we suppose that the different species were immediately carried off by a whirlwind, or other supernatural means, to their proper countries, the difficulty will vanish: but if this is his Lordship's interpretation, it is certainly a very singular one.

84
General principles to be kept in view in reasoning on this subject.

Before entering upon a consideration of the particular arguments used by our author for proving the diversity of species in the human race, it will be proper to lay down the following general principles, which may serve as axioms. (1.) When we assert a multiplicity of species in the human race; we bring in a supernatural cause to solve a natural phenomenon: for these species are supposed to be the immediate work of the Deity. (2.) No person has a right to call any thing the immediate effect of omnipotence, unless by express revelation from the Deity, or from a certainty that no natural cause is sufficient to produce the effect. The reason is plain. The Deity is invisible, and so are many natural causes: when we see an effect therefore, of which the cause does not manifest itself, we cannot know whether the immediate cause is the Deity, or an invisible natural power. An example of this we have in the phenomena of thunder and earthquakes, which were often ascribed immediately to the Deity, but are now discovered to be the effects of electricity. (3.) No person can assert natural causes to be insufficient to produce such and such effects, unless he perfectly knows all these causes, and the limits of their power in all possible cases; and this no man has ever known, or can know.

By keeping in view these principles, which we hope are self-evident, we will easily see Lord Kames's arguments

America. guments to confift entirely in a *petitio principii.*—In fubftance they are all reduced to this fingle fentence: "Natural philofophers have been hitherto unfuccefsful in their endeavours to account for the differences obferved among mankind, therefore thefe differences cannot be accounted for from natural caufes."

85 Inconfiftency in Lord Kames's arguments.

His Lordfhip, however, tells us in the paffages already quoted, that "a maftiff differs not more from a fpaniel, than a Laplander from a Dane;" that "it is vain to afcribe to climate the low ftature of the Laplanders, or their ugly vifage."—Yet, in a note on the word *Laplanders*, he fubjoins, that, "by late accounts it appears, that the Laplanders are only degenerated Tartars; and that they and the Hungarians originally fprung from the fame breed of men, and from the fame country."—The Hungarians are generally handfome and well-made, like Danes, or like other people. The Laplanders, he tells us, differ as much from them as a maftiff from a fpaniel. Natural caufes, therefore, according to Lord Kames himfelf, may caufe two individuals of the fame fpecies of mankind differ from each other as much as a maftiff does from a fpaniel.

86 Remarkable difference of colour from accidental caufes.

While we are treating this fubject of colour, it may not be amifs to obferve, that a very remarkable difference of colour may accidentally happen to individuals of the fame fpecies. In the ifthmus of Darien, a fingular race of men have been difcovered.—They are of low ftature, of a feeble make, and incapable of enduring fatigue. Their colour is a dead milk white; not refembling that of fair people among Europeans, but without any blufh or fanguine complexion. Their fkin is covered with a fine hairy down of a chalky white; the hair of their heads, their eye-brows, and eye-lafhes, are of the fame hue. Their eyes are of a fingular form, and fo weak, that they can hardly bear the light of the fun; but they fee clearly by moon-light, and are moft active and gay in the night. Among the negroes of Africa, as well as the natives of the Indian iflands, a fmall number of thefe people are produced. They are called *Albinos* by the Portuguefe, and *Kackerlakes* by the Dutch.

87 Colour no characteriftic of a different fpecies.

This race of men is not indeed permanent; but it is fufficient to fhow, that mere *colour* is by no means the characteriftic of a certain fpecies of mankind. The difference of colour in thefe individuals is undoubtedly owing to a natural caufe. To conftitute, then, a race of men of this colour, it would only be neceffary that this caufe, which at prefent is merely accidental, fhould become permanent, and we cannot know but it may be fo in fome parts of the world.

88 Nor ftature.

If a difference in colour is no characteriftic of a different fpecies of mankind, much lefs can a difference in ftature be thought fo.—In the fouthern parts of America, there are faid to be a race of men exceeding the common fize in height and ftrength*. This account, however, is doubted of by fome; but be that as it will, it is certain that the Efquimaux are as much under the common fize, as the Patagonians are faid to be above it. Neverthelefs we are not to imagine, that either of thefe are fpecific differences; feeing the Laplanders and Hungarians are both of the fame fpecies, and yet the former are generally almoft a foot fhorter than the latter; and if a difference of climate, or other accidental caufes, can make the people of one country a foot fhorter than the common fize of mankind, undoubtedly accidental caufes of a contrary nature may make thofe of another country a foot taller than other men.

* See *Patagonia*.

89 Different caufes contribute towards an alteration in colour.

Though the fun has undoubtedly a fhare in the production of the fwarthy colour of thofe nations which are moft expofed to his influence; yet the manner of living to which people are accuftomed, their victuals, their employment, &c. muft contribute very much to a difference of complexion. There are fome kinds of colouring roots, which, if mixed with the food of certain animals, will tinge even their bones of a yellow colour.—It cannot be thought any great degree of credulity to infer from this, that if thefe roots were mixed with the food of a white man, they might, without a miracle, tinge his fkin of a yellow colour. If a man and woman were both to ufe food of this kind for a length of time, till they became as it were *radically dyed*, it is impoffible, without the intervention of divine power, or of fome extraordinary natural caufe, but their children muft be of the fame colour; and was the fame kind of food to be continued for feveral generations, it is more than probable that this colour might refift the continued ufe of any kind of food whatever. See further the article COMPLEXION.

90 Habit capable of altering the inftinct of animals.

Of this indeed we have no examples, but we have an example of changes much more wonderful.—It is allowed on all hands, that it is more eafy to work a change upon the body of a man, or any other animal, than upon his mind. A man that is naturally choleric may indeed learn to prevent the bad effects of his paffion by reafon, but the paffion itfelf will remain as immutable as his colour.—But to reafon in a manner fimilar to Lord Kames; though a man fhould be naturally choleric, or fubject to any other paffion, why fhould his children be fo?—This way of reafoning, however plaufible, is by no means conclufive, as will appear from the following paffage in Mr Forfter's Voyage.

Voyage round the World, Vol. I. p. 234.

June 9th. "The officers who could not yet relifh their falt provifions after the refrefhments of New Zealand, had ordered their black dog, mentioned p. 135, to be killed: this day, therefore, we dined for the firft time on a leg of it roafted; which tafted fo exactly like mutton, that it was abfolutely undiftinguifhable. In our cold countries, where animal food is fo much ufed, and where to be carniverous perhaps lies in the nature of men, or is indifpenfibly neceffary to the prefervation of their health and ftrength, it is ftrange that there fhould exift a Jewifh averfion to dogs-flefh, when hogs, the moft uncleanly of all animals, are eaten without fcruple. Nature feems exprefsly to have intended them for this ufe, by making their offspring fo very numerous, and their increafe fo quick and frequent. It may be objected, that the exalted degree of inftinct which we obferve in our dogs, infpires us with great unwillingnefs to kill and eat them. But it is owing to the time we fpend on the education of dogs, that they acquire thofe eminent qualities which attach them fo much to us. The natural qualities of our dogs may receive a wonderful improvement; but education muft give its affiftance, without which the human mind itfelf, though capable of an immenfe expanfion, remains in a very contracted ftate. In New Zealand, and (according to former accounts of voyages) in the tropical ifles of the South Sea, the dogs are the moft ftupid, dull animals imaginable,

America. imaginable, and do not seem to have the least advantage in point of sagacity over our sheep, which are commonly made the emblems of fillinefs. In the former country they are fed upon fish, in the latter on vegetables, and both these diets may have served to alter their disposition. Education may perhaps likewise graft new instincts: the New Zealand dogs are fed on the remains of their master's meals; they eat the bones of other dogs; and the puppies become true cannibals from their birth. We had a young New Zealand puppy on board, which had certainly had no opportunity of tasting any thing but the mother's milk before we purchased it: however, it eagerly devoured a portion of the flesh and bones of the dog on which we dined today; while several others of the European breed taken on board at the Cape, turned from it without touching it.

Ibid. p. 243. "On the 4th of August, a young bitch, of the terrier breed, taken on board at the Cape of Good Hope, and covered by a spaniel, brought ten young ones, one of which was dead. The New Zealand dog mentioned above, which devoured the bones of the roasted dog, now fell upon the dead puppy, and eat of it with a ravenous appetite. This is a proof how far education may go in producing and propagating new instincts in animals. European dogs are never fed on the meat of their own species, but rather seem to abhor it. The New Zealand dogs, in all likelihood, are trained up from their earliest age to eat the remains of their master's meals: they are therefore used to feed upon fish; their own species; and perhaps human flesh; and what was only owing to habit at first, may have become instinct by length of time. This was remarkable in our cannibal dog; for he came on board so young, that he could not have been weaned long enough to have acquired a habit of devouring his own species, and much less of eating human flesh; however, one of our seamen having cut his finger, held it out to the dog, who fell to greedily, licked it, and then began to bite it."

From this account it appears, that even the instincts of animals are not unchangeable by natural causes; and if these causes are powerful enough to change the dispositions of succeeding generations, much more may we suppose them capable of making any possible alteration in the external appearance.

100
Confirmed by an observation on the Franks.

We are not here necessitated to confine ourselves to observations made on brute animals. The Franks are an example of the production of one general character, formed by some natural cause from a mixture of many different nations.—They were a motley multitude, consisting of various German nations dwelling beyond the Rhine: who, uniting in defence of their common liberty, took thence the name of *Franks;* the word *frank* signifying in their language, as it still does in ours, *free*. Among them the following nations were mentioned, viz. the Actuarii, Chamavi, Bructeri, Salii, Frisii, Chausi, Amswarii, and Catti. We cannot suppose one character to belong to so many different nations; yet it is certain that the Franks were nationally characterized as treacherous; and so deeply seems this quality to have been rooted in their nature, that their descendants have not got quite free of it in 1500 years. It is in vain, then, to talk of different races of men, either from their colour, size, or prevailing dispositions, seeing we have undeniable proofs that all these may be changed, in the most remarkable manner, by natural causes, without any miraculous interposition of the Deity. America.

The next question, then, which presents itself, is, From what part of the Old World America has most probably been peopled?

101
Of the peopling of America.

Discoveries long ago made inform us, that an intercourse between the Old continent and America might be carried on with facility from the north-west extremities of Europe and the north-east boundaries of Asia. In the ninth century the Norwegians discovered Greenland, and planted a colony there. The communication with that country was renewed in the last century by Moravian missionaries, in order to propagate their doctrines in that bleak and uncultivated region. By them we are informed that the north-west coast of Greenland is separated from America by a very narrow strait; that at the bottom of the bay it is highly probable that they are united; that the Esquimaux of America perfectly resemble the Greenlanders in their aspect, dress, and mode of living; and that a Moravian missionary, well acquainted with the language of Greenland, having visited the country of the Esquimaux, found, to his astonishment, that they spoke the same language with the Greenlanders, and were in every respect the same people. The same species of animals, too, are found in the contiguous regions. The bear, the wolf, the fox, the hare, the deer, the roebuck, the elk, frequent the forests of North America, as well as those in the north of Europe.

102
A communication between the Old and New Continents by two ways.

Other discoveries have proved, that if the two continents of Asia and America be separated at all, it is only by a narrow strait. From this part of the Old continent, also, inhabitants may have passed into the New; and the resemblance between the Indians of America and the eastern inhabitants of Asia, would induce us to conjecture that they have a common origin. This is the opinion adopted by Dr Robertson in his History of America *, where we find it accompanied with the following narrative.

* *History of America*, Vol. I. p. 273.

"While those immense regions which stretched eastward from the river Oby to the sea of Kamtschatka were unknown, or imperfectly explored, the north-east extremities of our hemisphere were supposed to be so far distant from any part of the New World, that it was not easy to conceive how any communication should have been carried on between them. But the Russians, having subjected the western part of Siberia to their empire, gradually extended their knowledge of that vast country, by advancing towards the east into unknown provinces. These were discovered by hunters in their excursions after game, or by soldiers employed in levying the taxes; and the court of Moscow estimated the importance of those countries only by the small addition which they made to its revenue. At length, Peter the Great ascended the Russian throne: His enlightened, comprehensive mind, intent upon every circumstance that could aggrandize his empire, or render his reign illustrious, discerned consequences of those discoveries, which had escaped the observation of his ignorant predecessors. He perceived, that, in proportion as the regions of Asia extended towards the east, they must approach nearer to America; that the communication between the two continents, which had long been search-

ed

ed for in vain, would probably be found in this quarter; and that, by opening this intercourſe, ſome part of the wealth and commerce of the weſtern world might be made to flow into his dominions by a new channel. Such an object ſuited a genius that delighted in grand ſchemes. Peter drew up inſtructions with his own hand for proſecuting this deſign, and gave orders for carrying it into execution.

"His ſucceſſors adopted his ideas, and purſued his plan. The officers whom the Ruſſian court employed in this ſervice, had to ſtruggle with ſo many difficulties, that their progreſs was extremely ſlow. Encouraged by ſome faint traditions among the people of Siberia concerning a ſucceſsful voyage in the year 1648 round the north-eaſt promontory of Aſia, they attempted to follow the ſame courſe. Veſſels were fitted out, with this view, at different times, from the rivers Lena and Kolyma; but in a frozen ocean, which nature ſeems not to have deſtined for navigation, they were expoſed to many diſaſters, without being able to accompliſh their purpoſe. No veſſel fitted out by the Ruſſian court ever doubled this formidable cape; we are indebted for what is known of thoſe extreme regions of Aſia, to the diſcoveries made in excurſions by land. In all thoſe provinces, an opinion prevails, that countries of great extent and fertility lie at no conſiderable diſtance from their own coaſts. Theſe the Ruſſians imagined to be part of America; and ſeveral circumſtances concurred not only in confirming them in this belief, but in perſuading them that ſome portion of that continent could not be very remote. Trees of various kinds, unknown in thoſe naked regions of Aſia, are driven upon the coaſt by an eaſterly wind. By the ſame wind floating ice is brought thither in a few days; flights of birds arrive annually from the ſame quarter; and a tradition obtains among the inhabitants, of an intercourſe formerly carried on with ſome countries ſituated to the eaſt.

"After weighing all theſe particulars, and comparing the poſition of the countries in Aſia which they had diſcovered, with ſuch parts in the north-weſt of America as were already known; the Ruſſian court formed a plan, which would have hardly occurred to any nation leſs accuſtomed to engage in arduous undertakings and to contend with great difficulties. Orders were iſſued to build two veſſels at Ochotz, in the ſea of Kamtſchatka, to ſail on a voyage of diſcovery. Though that dreary uncultivated region furniſhed nothing that could be of uſe in conſtructing them but ſome larch-trees; though not only the iron, the cordage, the ſails, and all the numerous articles requiſite for their equipment, but the proviſions for victualling them, were to be carried through the immenſe deſerts of Siberia, along rivers of difficult navigation, and roads almoſt impaſſable, the mandate of the ſovereign, and the perſeverance of the people, at laſt ſurmounted every obſtacle. Two veſſels were finiſhed; and, under the command of the captains Behring and Tſchirikow, ſailed from Kamtſchatka in queſt of the New World, in a quarter where it had never been approached. They ſhaped their courſe towards the eaſt; and though a ſtorm ſoon ſeparated the veſſels, which never rejoined, and many diſaſters befel them, the expectations from the voyage were not altogether fruſtrated. Each of the commanders diſcovered land, which to them appeared to be part of the American continent; and, according to their obſervations, it ſeems to be ſituated within a few degrees of the north-weſt coaſt of California. Each ſet ſome of his people aſhore: but in one place the inhabitants fled as the Ruſſians approached; in another, they carried off thoſe who landed, and deſtroyed their boats. The violence of the weather, and the diſtreſs of their crews, obliged both to quit this inhoſpitable coaſt. In their return they touched at ſeveral iſlands, which ſtretch in a chain from eaſt to weſt between the country which they had diſcovered and the coaſt of Aſia. They had ſome intercourſe with the natives, who ſeemed to them to reſemble the North Americans. They preſented to the Ruſſians the calumet, or pipe of peace, which is a ſymbol of friendſhip univerſal among the people of North America, and an uſage of arbitrary inſtitution peculiar to them."

103
Reaſons for ſuppoſing the two continents to have been once joined.

The more recent and accurate diſcoveries of the illuſtrious navigator Cooke, and his ſucceſſor Clerke, have brought the matter ſtill nearer to certainty. The ſea, from the ſouth of Bering's Straits to the creſcent of iſles between Aſia and America, is very ſhallow. It deepens from theſe ſtraits (as the Britiſh ſeas do from thoſe of Dover) till ſoundings are loſt in the Pacific Ocean; but that does not take place but to the ſouth of the iſles. Between them and the ſtraits is an increaſe from 12 to 54 fathom, except only off St Thaddeus Noſs, where there is a channel of greater depth. From the volcanic diſpoſition, it has been judged probable, not only that there was a ſeparation of the continents at the ſtraits of Bering, but that the whole ſpace from the iſles to that ſmall opening had once been occupied by land; and that the fury of the watery element, actuated by that of fire, had, in moſt remote times, ſubverted and overwhelmed the tract, and left the iſlands monumental fragments.

104
Probable cauſe of their ſubſequent ſeparation.

Without adopting all the fancies of Buffon, there can be no doubt, as the Abbé Clavigero obſerves, that our planet has been ſubject to great viciſſitudes ſince the deluge. Ancient and modern hiſtories confirm the truth which Ovid has ſung in the name of Pythagoras:

Video ego quod fuerat quondam ſolidiſſima tellus,
Eſſe fretum; vidi factas ex æquore terras.

At preſent they plough thoſe lands over which ſhips formerly ſailed, and now they ſail over lands which were formerly cultivated; earthquakes have ſwallowed ſome lands, and ſubterraneous fires have thrown up others; the rivers have formed new ſoil with their mud; the ſea retreating from the ſhores has lengthened the land in ſome places, and advancing in others has diminiſhed it; it has ſeparated ſome territories which were formerly united, and formed new ſtraits and gulphs. We have examples of all theſe revolutions in the paſt century. Sicily was united to the continent of Naples, as Eubea, now the Black Sea, to Bœotia. Diodorus, Strabo, and other ancient authors, ſay the ſame thing of Spain and Africa, and affirm, that by a violent eruption of the ocean upon the land between the mountains Abyla and Calpe, that communication was broken, and the Mediterranean Sea was formed. Among the people of Ceylon there is a tradition that a ſimilar irruption of the ſea ſeparated their iſland from the peninſula of India. The ſame thing is believed by thoſe of Malabar with reſpect to the iſles of Maldivia, and

America. and with the Malayans with reſpect to Sumatra. It is certain, ſays the Count de Buffon, that in Ceylon the earth has loſt 30 or 40 leagues, which the ſea has taken from it; on the contrary, Tongres, a place of the Low Countries, has gained 30 leagues of land from the ſea. The northern part of Egypt owes its exiſtence to inundations of the Nile. The earth which this river has brought from the inland countries of Africa, and depoſited in its inundations, has formed a ſoil of more than 25 cubits of depth. In like manner, adds the above author, the province of the Yellow River in China, and that of Louiſiana, have only been formed of the mud of rivers. Pliny, Seneca, Diodorus, and Strabo, report innumerable examples of ſimilar revolutions, which we omit, that our diſſertation may not become too prolix; as alſo many modern revolutions, which are related in the theory of the earth of the Count de Buffon and other authors. In South America, all thoſe who have obſerved with philoſophic eyes the peninſula of Yucatan, do not doubt that that country has once been the bed of the ſea; and, on the contrary, in the channel of Bahama many indications ſhow the iſland of Cuba to have been once united to the continent of Florida. In the ſtrait which ſeparates America from Aſia many iſlands are found, which probably were the mountains belonging to that tract of land which we ſuppoſe to have been ſwallowed up by earthquakes; which is made more probable by the multitude of volcanoes which we know of in the peninſula of Kamtſchatka. It is imagined, however, that the ſinking of that land, and the ſeparation of the two continents, has been occaſioned by thoſe great and extraordinary earthquakes mentioned in the hiſtories of the Americans, which formed an æra almoſt as memorable as that of the deluge. The hiſtories of the Toltecas fix ſuch earthquakes in the year I Tecpatl; but as we know not to what century that belonged, we can form no conjecture of the time that great calamity happened. If a great earthquake ſhould overwhelm the iſthmus of Suez, and there ſhould be at the ſame time as great a ſcarcity of hiſtorians as there were in the firſt ages after the deluge, it would be doubted, in 300 or 400 years after, whether Aſia had ever been united by that part to Africa; and many would firmly deny it.

105 parated ly by a rrow ait.

Whether that great event, the ſeparation of the continents, took place before or after the population of America, is as impoſſible as it is of little moment for us to know; but we are indebted to abovementioned navigators for ſettling the long diſpute about the point from which it was effected. Their obſervations prove, that in one place the diſtance between continent and continent is only 39 miles, not (as the author of the *Recherches Philoſophiques ſur les Americains* would have it) 800 leagues. This narrow ſtrait has alſo in the middle two iſlands, which would greatly facilitate the migration of the Aſiatics into the New World, ſuppoſing that it took place in canoes after the convulſion which rent the two continents aſunder. Beſides, it may be added, that theſe ſtraits are, even in the ſummer, often filled with ice; in winter, often frozen. In either caſe mankind might find an eaſy paſſage; in the laſt, the way was extremely ready for quadrupeds to croſs and ſtock the continent of America. But where, from the vaſt expanſe of the north-eaſtern world, to fix on the firſt tribes who contributed to people the New continent, now inhabited almoſt from end to end, is a matter that baffles human reaſon. The learned may make bold and ingenious conjectures, but plain good ſenſe connot always accede to them.

106 ſineſs of e paſſage tween em.

107 Conjectures concerning the firſt migrations into the New Continent.

As mankind increaſed in numbers, they naturally protruded one another forward. Wars might be another cauſe of migrations. There appears no reaſon why the Aſiatic north might not be an *officina virorum*, as well as the European. The overteeming country, to the eaſt of the Riphæan mountains, muſt find it neceſſary to diſcharge its inhabitants: the firſt great wave of people was forced forward by the next to it, more tumid and more powerful than itſelf: ſucceſſive and new impulſes continually arriving, ſhort reſt was given to that which ſpread over a more eaſtern tract; diſturbed again and again, it covered freſh regions; at length, reaching the fartheſt limits of the Old World, found a new one, with ample ſpace to occupy unmoleſted for ages; till Columbus curſed them by a diſcovery, which brought again new ſins and new deaths to both worlds.

108 Mr Pennant's opinion.

"The inhabitants of the New World (Mr Pennant obſerves), do not conſiſt of the offspring of a ſingle nation: different people, at ſeveral periods, arrived there; and it is impoſſible to ſay, that any one is now to be found on the original ſpot of its colonization. It is impoſſible, with the lights which we have ſo recently received, to admit that America could receive its inhabitants (at leaſt the bulk of them) from any other place than eaſtern Aſia. A few proofs may be added, taken from cuſtoms or dreſſes common to the inhabitants of both worlds: ſome have been long extinct in the old, others remain in both in full force.

109 The bulk of its inhabitants probably firſt received from the eaſtern part of Aſia.

"The cuſtom of ſcalping was a barbariſm in uſe with the Scythians, who carried about them at all times this ſavage mark of triumph: they cut a circle round the neck, and ſtripped off the ſkin, as they would that of an ox. A little image, found among the Kalmucs, of a Tartarian deity, mounted on a horſe, and ſitting on a human ſkin, with ſcalps pendent from the breaſt, fully illuſtrates the cuſtom of the Scythian progenitors, as deſcribed by the Greek hiſtorian. This uſage, as the Europeans know by horrid experience, is continued to this day in America. The ferocity of the Scythians to their priſoners extended to the remoteſt part of Aſia. The Kamtſchatkans, even at the time of their diſcovery by the Ruſſians, put their priſoners to death by the moſt lingering and excruciating inventions; a practice in full force to this very day among the aboriginal Americans. A race of the Scythians were ſtyled *Anthropophagi*, from their feeding on human fleſh. The people of Nootka Sound ſtill make a repaſt on their fellow-creatures: but what is more wonderful, the ſavage allies of the Britiſh army have been known to throw the mangled limbs of the French priſoners into the horrible cauldron, and devour them with the ſame reliſh as thoſe of a quadruped.

110 Proofs from a ſimilarity of cuſtoms, &c.

"The Scythians were ſaid, for a certain time, annually to transform themſelves into wolves, and again to reſume the human ſhape. The new diſcovered Americans about Nootka Sound, at this time diſguiſe themſelves in dreſſes made of the ſkins of wolves and other wild beaſts, and wear even the heads fitted to their own. Theſe habits they uſe in the chace, to circumvent the animals of the field. But would not ignorance or ſuperſtition aſcribe to a ſupernatural metamorphoſis

America.

tamorphoſis theſe temporary expedients to deceive the brute creation ?

111 Cuſtoms and dreſſes common to the eaſtern Aſiatics and the Americans.

" In their marches, the Kamtſchatkans never went abreaſt, but followed one another in the ſame tract. The ſame cuſtom is exactly obſerved by the Americans.

" The Tunguſi, the moſt numerous nation reſident in Sibiria, prick their faces with ſmall punctures, with a needle, in various ſhapes ; then rub into them charcoal, ſo that the marks become indelible. This cuſtom is ſtill obſerved in ſeveral parts of America. The Indians on the back of Hudſon's bay, to this day, perform the operation exactly in the ſame manner, and puncture the ſkin into various figures ; as the natives of New Zealand do at preſent, and as the ancient Britons did with the herb glaſtum, or woad ; and the Virginians, on the firſt diſcovery of that country by the Engliſh.

" The Tunguſi uſe canoes made of birch-bark, diſtended over ribs of wood, and nicely ſewed together. The Canadian, and many other American nations, uſe no other ſort of boats. The paddles of the Tunguſi are broad at each end ; thoſe of the people near Cook's river, and of Oonalaſcha, are of the ſame form.

" In burying of the dead, many of the American nations place the corpſe at full length, after preparing it according to their cuſtoms ; others place it in a ſitting poſture, and lay by it the moſt valuable cloathing, wampum, and other matters. The Tartars did the ſame : and both people agree in covering the whole with earth, ſo as to form a tumulus, barrow, or carnedd.

" Some of the American nations hang their dead in trees. Certain of the Tunguſi obſerve a ſimilar cuſtom.

" We can draw ſome analogy from dreſs : conveniency in that article muſt have been conſulted on both continents, and originally the materials muſt have been the ſame, the ſkins of birds and beaſts. It is ſingular, that the conic bonnet of the Chineſe ſhould be found among the people of Nootka. I cannot give into the notion, that the Chineſe contributed to the population of the New World ; but we can readily admit, that a ſhipwreck might furniſh thoſe Americans with a pattern for that part of the dreſs.

112 Other reſemblances.

" In reſpect to the features and form of the human body, almoſt every tribe found along the weſtern coaſt has ſome ſimilitude to the Tartar nations, and ſtill retain the little eyes, ſmall noſes, high cheeks, and broad faces. They vary in ſize, from the luſty Calmucs to the little Nogaians. The internal Americans, ſuch as the Five Indian nations, who are tall of body, robuſt in make, and of oblong faces, are derived from a variety among the Tartars themſelves. The fine race of Tſchutſki ſeem to be the ſtock from which thoſe Americans are derived. The Tſchutſki, again, from that fine race of Tartars the Kabardinſki, or inhabitants of Kabarda.

" But about Prince William's Sound begins a race chiefly diſtinguiſhed by their dreſs, their canoes, and their inſtruments of the chace, from the tribes to the ſouth of them. Here commences the Eſquimaux people, or the race known by that name in the high latitudes of the eaſtern ſide of the continent. They may be divided into two varieties. At this place they are of the largeſt ſize. As they advance northward they decreaſe in height, till they dwindle into the dwarfiſh tribes which occupy ſome of the coaſts of the Icy Sea, and the maritime parts of Hudſon's Bay, of Greenland, and Terra de Labrador. The famous Japaneſe map places ſome iſlands ſeemingly within the Straits of Bering, on which is beſtowed the title of *Ya Zue*, or the Kingdom of the Dwarfs. Does not this in ſome manner authenticate the chart, and give us reaſon to ſuppoſe that America was not unknown to the Japaneſe ; and that they had (as is mentioned by Kæmpfer and Charlevoix) made voyages of diſcovery, and, according to the laſt, actually wintered on the continent ? That they might have met with the Eſquimaux is very probable ; whom, in compariſon of themſelves, they might juſtly diſtinguiſh by the name of *dwarfs*. The reaſon of their low ſtature is very obvious : theſe dwell in a moſt ſevere climate, amidſt penury of food ; the former in one much more favourable, abundant in proviſions ; circumſtances that tend to prevent the degeneracy of the human frame. At the iſland of Oonalaſcha, a dialect of the Eſquimaux is in uſe, which was continued along the whole coaſt from thence northward."

113 The brute creation migrated by the ſame route.

The continent which ſtocked America with the human race poured in the brute creation through the ſame paſſage. Very few quadrupeds continued in the peninſula of Kamtſchatka ; Mr Pennant enumerates only 25 which are inhabitants of land : all the reſt perſiſted in their migration, and fixed their reſidence in the New World. Seventeen of the Kamtſchatkan quadrupeds are found in America : others are common only to Siberia or Tartary, having, for unknown cauſes, entirely evacuated Kamtſchatka, and divided themſelves between America and the parts of Aſia above cited. Multitudes again have deſerted the Old World, even to an individual, and fixed their ſeats at diſtances moſt remote from the ſpot from which they took their departure ; from mount Ararat, the reſting-place of the ark, in a central part of the Old World, and excellently adapted for the diſperſion of the animal creation to all its parts. " We need not be ſtartled (ſays Mr Pennant) at the vaſt journeys many of the quadrupeds took to arrive at their preſent ſeats. Might not numbers of ſpecies have found a convenient abode in the vaſt Alps of Aſia, inſtead of wandering to the Cordilleras of Chili ? or might not others have been contented with the boundleſs plains of Tartary, inſtead of travelling thouſands of miles to the extenſive flats of Pampas ?—To endeavour to elucidate common difficulties is certainly a trouble worthy of the philoſopher and of the divine ; not to attempt it would be a criminal indolence, a neglect to

Vindicate the ways of God to man.

But there are multitudes of points beyond the human ability to explain, and yet are truths undeniable : the facts are indiſputable, notwithſtanding the cauſes are concealed. In ſuch caſes, faith muſt be called in to our relief. It would certainly be the height of folly to deny to that Being who broke open the great fountains of the deep to effect the deluge—and afterwards, to compel the diſperſion of mankind to people the globe, directed the confuſion of languages—powers inferior in their nature to theſe. After theſe wondrous

wondrous proofs of Omnipotency, it will be abſurd to deny the poſſibility of infuſing inſtinct into the brute creation. *Deus eſt anima brutorum;* "God himſelf is the ſoul of brutes:" His pleaſure muſt have determined their will, and directed ſeveral ſpecies, and even whole genera, by impulſe irreſiſtible, to move by ſlow progreſſion to their deſtined regions. But for that, the llama and the pacos might ſtill have inhabited the heights of Armenia and ſome more neighbouring Alps, inſtead of labouring to gain the diſtant Peruvian Andes; the whole genus of armadillos, ſlow of foot, would never have quitted the torrid zone of the Old World for that of the New; and the whole tribe of monkeys would have gamboled together in the foreſts of India, inſtead of dividing their reſidence between the ſhades of Indoſtan and the deep foreſts of the Braſils. Lions and tigers might have infeſted the hot parts of the New World, as the firſt do the deſarts of Africa, and the laſt the provinces of Aſia; or the pantherine animals of South America might have remained additional ſcourges with the ſavage beaſts of thoſe ancient continents. The Old World would have been overſtocked with animals; the New remained an unanimated waſte! or both have contained an equal portion of every beaſt of the earth. Let it not be objected, that animals bred in a ſouthern climate, after the deſcent of their parents from the ark, would be unable to bear the froſt and ſnow of the rigorous north, before they reached South America, the place of their final deſtination. It muſt be conſidered, that the migration muſt have been the work of ages; that in the courſe of their progreſs each generation grew hardened to the climate it had reached; and that after their arrival in America, they would again be gradually accuſtomed to warmer and warmer climates, in their removal from north to ſouth, as they had in the reverſe, or from ſouth to north. Part of the tigers ſtill inhabit the eternal ſnows of Ararat, and multitudes of the very ſame ſpecies live, but with exalted rage, beneath the line, in the burning ſoil of Borneo or Sumatra; but neither lions or tigers ever migrated into the New World. A few of the firſt are found in India and Perſia, but they are found in numbers only in Africa. The tiger extends as far north as weſtern Tartary, in lat. 40. 50, but never has reached Africa."

In fine, the conjectures of the learned reſpecting the vicinity of the Old and New, are now, by the diſcoveries of our great navigators, loſt in conviction; and, in the place of imaginary hypotheſes, the real place of migration is uncontrovertibly pointed out. Some (from a paſſage in Plato) have extended over the Atlantic, from the ſtraits of Gibraltar to the coaſt of North and South America, an iſland equal in ſize to the continents of Aſia and Africa; over which had paſſed, as over a bridge, from the latter, men and animals; wool-headed negroes, and lions and tigers, none of which ever exiſted in the New World. A mighty ſea aroſe, and in one day and night engulphed this ſtupendous tract, and with it every being which had not completed its migration into America. The whole negro race, and almoſt every quadruped, now inhabitants of Africa, periſhed in this critical day. Five only are to be found at preſent in America; and of theſe only one, the bear, in South America: Not a ſingle cuſtom, common to the natives of Africa and America, to evince a common origin. Of the quadrupeds, the bear, ſtag, wolf, fox, and weeſel, are the only animals which we can pronounce with certainty to be found on each continent. The ſtag, fox, and weeſel, have made alſo no farther progreſs in Africa than the north; but on the ſame continent the wolf is ſpread over every part, yet is unknown in South America, as are the fox and weeſel. In Africa and South America the bear is very local, being met with only in the north of the firſt, and on the Andes in the laſt. Some cauſe unknown arreſted its progreſs in Africa, and impelled the migration of a few into the Chilian Alps, and induced them to leave unoccupied the vaſt tract from North America to the lofty Cordilleras.

114
Remains of antiquity in America.

Alluſions have often been made to ſome remains on the continent of America, of a more poliſhed and cultivated people, when compared with the tribes which poſſeſſed it on its firſt diſcovery by Europeans. Mr Barton, in his *Obſervations on ſome parts of Natural Hiſtory*, Part I. has collected the ſcattered hints of Kalm, Carver, and ſome others, and has added a plan of a regular work, which has been diſcovered on the banks of the Muſkingum, near its junction with the Ohio. Theſe remains are principally ſtone-walls, large mounds of earth, and a combination of theſe mounds with the walls, ſuſpected to have been fortifications. In ſome places the ditches and the fortreſs are ſaid to have been plainly ſeen; in others, furrows, as if the land had been ploughed.

The mounds of earth are of two kinds: they are artificial tumuli, deſigned as repoſitories for the dead; or they are of a greater ſize, for the purpoſe of defending the adjacent country; and with this view they are artificially conſtructed, or advantage is taken of the natural eminences, to raiſe them into a fortification.

The remains near the banks of the Muſkingum, are ſituated about one mile above the junction of that river with the Ohio, and 160 miles below Fort Pitt. They conſiſt of a number of walls and other elevations, of ditches, &c. altogether occupying a ſpace of ground about 300 perches in length, and from about 150 to 25 or 20 in breadth. The town, as it has been called, is a large level, encompaſſed by walls, nearly in the form of a ſquare, the ſides of which are from 96 to 86 perches in length. Theſe walls are, in general, about 10 feet in height above the level on which they ſtand, and about 20 feet in diameter at the baſe, but at the top they are much narrower: they are at preſent overgrown with vegetables of different kinds, and, among others, with trees of ſeveral feet diameter. The chaſms, or openings in the walls, were probably intended for gate-ways: they are three in number at each ſide, beſides the ſmaller openings in the angles. Within the walls there are three elevations, each about ſix feet in height, with regular aſcents to them: theſe elevations conſiderably reſemble ſome of the eminences already mentioned, which have been diſcovered near the river Miſſiſippi. This author's opinion is, That the Tolticas, or ſome other Mexican nation, were the people to whom the mounts and fortifications, which he has deſcribed, owe their exiſtence; and that thoſe people were probably the deſcendants of the Danes. The former part of this conjecture is thought probable, from the ſimilarity of the Mexican mounts and

America.

and fortifications deſcribed by the Abbé Clavigero, and other authors, to thoſe deſcribed by our author; and from the tradition of the Mexicans, that they come from the north-weſt: for, if we can rely on the teſtimony of late travellers, fortifications ſimilar to thoſe mentioned by Mr Barton have been diſcovered as far to the north as Lake Pepin; and we find them, as we approach to the ſouth, even as low as the coaſts of Florida. The ſecond part of our author's conjecture appears not ſo well ſupported.

115
The ancients ſuppoſed to have had ſome imperfect notion of a new world.

It is believed by many, that the ancients had ſome imperfect notion of a new world; and ſeveral ancient authors are quoted in confirmation of this. In a book aſcribed to the philoſopher Ariſtotle, we are told that the Carthaginians diſcovered an iſland far beyond the pillars of Hercules, large, fertile, and finely watered with navigable rivers, but uninhabited. This iſland was diſtant a few days ſailing from the continent; its beauty induced the diſcoverers to ſettle there; but the policy of Carthage diſlodged the colony, and laid ſtrict prohibition on all the ſubjects of the ſtate not to attempt any future eſtabliſhment. This account is alſo confirmed by an hiſtorian of no mean credit, who relates, that the Tyrians would have ſettled a colony on the new-diſcovered iſland, but were oppoſed by the Carthaginians for ſtate reaſons. The following paſſage has alſo been quoted from Seneca's *Medea*, in confirmation of this notion.

> —— *Venient annis*
> *Sæcula ſeris, quibus oceanus*
> *Vincula rerum laxet, & ingens*
> *Pateat tellus, Typhiſque novos*
> *Delegat orbes; nec ſit terris*
> *Ultima Thule.*——
>
> Act. iii. ver. 375.

Other authors are alſo quoted in ſupport of this belief. But however this may be, nobody ever believed the exiſtence of this continent ſo firmly as to go in queſt of it; at leaſt, there are no accounts well ſupported that America received any part of its firſt inhabitants from Europe prior to the 15th century.

116
Pretenſions of the Welſh to the diſcovery of America in the 12th century.

The Welſh fondly imagine that our country contributed, in 1170, to people the New World, by the adventure of Madoc, ſon of Owen Gwynedd, who, on the death of his father, ſailed there, and colonized part of the country. All that is advanced in proof is, a quotation from one of our poets, which proves no more than that he had diſtinguiſhed himſelf by ſea and land. It is pretended that he made two voyages: that ſailing weſt, he left Ireland ſo far to the north, that he came to a land unknown, where he ſaw many ſtrange things; that he returned home, and, making a report of the fruitfulneſs of the new-diſcovered country, prevailed on numbers of the Welſh of each ſex to accompany him on a ſecond voyage, from which he never returned. The favourers of this opinion aſſert, that ſeveral Welſh words, ſuch as *gwrando*, "to hearken or liſten;" the iſle of *Croeſo*, or "welcome;" *Cape Breton*, from the name of our own iſland; *gwynndwr*, or "the white water;" and *pengwin*, or "the bird with a white head;" are to be found in the American language. But likeneſs of ſound in a few words will not be deemed ſufficient to eſtabliſh the fact; eſpecially if the meaning has been evidently perverted: for example, the whole pinguin tribe have unfortunately not only black heads, but are not inhabitants of the northern hemiſphere; the name was alſo beſtowed on them by the Dutch, *à pinguedine*, from their exceſſive fatneſs: but the inventor of this, thinking to do honour to our country, inconſiderately caught at a word of European origin, and unheard of in the New World. It may be added, that the Welſh were never a naval people; that the age in which Madoc lived was peculiarly ignorant in navigation; and the moſt which they could have attempted muſt have been a mere coaſting voyage.

117
Thoſe of the Norwegians better founded.

The Norwegians put in for a ſhare of the glory, on grounds rather better than the Welſh. By their ſettlements in Iceland and in Greenland, they had arrived within ſo ſmall a diſtance of the New World, that there is at leaſt a poſſibility of its having been touched at by a people ſo verſed in maritime affairs, and ſo adventurous, as the ancient Nortmans were. The proofs are much more numerous than thoſe produced by the Britiſh hiſtorians; for the diſcovery is mentioned in ſeveral of the Icelandic manuſcripts. The period was about the year 1002, when it was viſited by one Biorn; and the diſcovery purſued to greater effect by Leif, the ſon of Eric, the diſcoverer of Greenland. It does not appear that they reached farther than Labrador; on which coaſt they met with Eſquimaux, on whom they beſtowed the name of *Skrælingues*, or dwarfiſh people, from their ſmall ſtature. They were armed with bows and arrows, and had leathern canoes, ſuch as they have at preſent. All this is probable; nor ſhould the tale of the German, called *Turkil*, one of the crew, invalidate the account. He was one day miſſing; but ſoon returned, leaping and ſinging with all the extravagant marks of joy a *bon vivant* could ſhow, on diſcovering the inebriating fruit of his country, the grape: Torfæus even ſays, that he returned in a ſtate of intoxication. To convince his commander, he brought ſeveral bunches, who from that circumſtance named the country *Vinland*. It is not to be denied that North America produces the true vine; but it is found in far lower latitudes than our adventurers could reach in the time employed in their voyage, which was comprehended in a very ſmall ſpace. There appears no reaſon to doubt of the diſcovery; but as the land was never colonized, nor any advantages made of it, it may be fairly conjectured, that they reached no farther than the barren country of Labrador. In ſhort, it is from a much later period that we muſt date the real diſcovery of America.

118
The projects of Chriſtopher Columbus.

Towards the cloſe of the 15th century, Venice and Genoa being rivals in commerce, in which the former had greatly the ſuperiority, Chriſtopher Columbus, a native of Genoa, whoſe knowledge of the true figure of the earth, however attained, was much ſuperior to the general notions of the age in which he lived, conceived a project of ſailing to the Eaſt Indies by directing his courſe weſtward. This deſign was founded upon a miſtake of the geographers of thoſe days, who placed the eaſtern parts of Aſia immenſely too far to the eaſtward; ſo that had they been in the right, the ſhorteſt way would have been to ſail directly weſtward. He applied firſt to his own countrymen; but being rejected by them, he applied to France, where he was laughed at and ridiculed. He next applied to Henry VII. of England; but meeting with a diſappointment there, he

he made an application to Portugal, where he met with the ſame mortifying reception. Spain was his next reſource; where, after eight years attendance, he obtained, in 1492, a fleet of three ſhips. The largeſt, a ſhip of no conſiderable burden, was commanded by Columbus as admiral, who gave it the name of *Santa Maria*, out of reſpect for the bleſſed Virgin, whom he honoured with ſingular devotion. Of the ſecond, called the *Pinta*, Martin Pinzon was captain, and his brother Francis pilot. The third, named the *Nigna*, was under the command of Vincent Yanez Pinzon. Theſe two were light veſſels, hardly ſuperior in burden or force to large boats. This ſquadron, if it merits that name, was victualled for 12 months, and had on board 90 men, moſtly ſailors, together with a few adventurers who followed the fortune of Columbus, and ſome gentlemen of Iſabella's court, whom ſhe appointed to accompany him. Though the expence of the undertaking was one of the circumſtances which chiefly alarmed the court of Spain, and retarded ſo long the negociation with Columbus, the ſum employed in fitting out this ſquadron did not exceed 4000 l. But as Columbus was deeply impreſſed with ſentiments of religion, he would not ſet out upon an expedition ſo arduous, and of which one great object was to extend the knowledge of the Chriſtian faith, without imploring publicly the guidance and protection of Heaven. With this view, he, together with all the perſons under his command, marched in ſolemn proceſſion to the monaſtery of Rabida. After confeſſing their ſins, and obtaining abſolution, they received the holy ſacrament from the hands of the guardian, who joined his prayers to theirs for the ſucceſs of an enterpriſe which he had ſo zealouſly patronized.

119 His voyage. Next morning, being Friday the third day of Auguſt in the year 1492, Columbus ſet ſail, a little before ſun-riſe, in preſence of a vaſt crowd of ſpectators, who ſent up their ſupplications to Heaven for the proſperous iſſue of the voyage, which they wiſhed, rather than expected. Columbus ſteered directly for the Canary iſlands, and arrived there without any occurrence that would have deſerved notice on any other occaſion: but in a voyage of ſuch expectation and importance, every circumſtance was the object of attention. The rudder of the Pinta broke looſe the day after ſhe left the harbour, and that accident alarmed the crew, no leſs ſuperſtitious than unſkilful, as a certain omen of the unfortunate deſtiny of the expedition. Even in the ſhort run to the Canaries, the ſhips were found to be ſo crazy and ill appointed, as to be very improper for a navigation which was expected to be both long and dangerous. Columbus refitted them, however, to the beſt of his power; and having ſupplied himſelf with freſh proviſions, he took his departure from Gomera, one of the moſt weſterly of the Canary iſlands, on the ſixth day of September.

Here the voyage of diſcovery may properly be ſaid to begin; for Columbus, holding his courſe due weſt, left immediately the uſual track of navigation, and ſtretched into unfrequented and unknown ſeas. The firſt day, as it was very calm, he made but little way; but on the ſecond, he loſt ſight of the Canaries; and many of the ſailors, dejected already and diſmayed, when they contemplated the boldneſs of the undertaking, began to beat their breaſts, and to ſhed tears, as if they were never more to behold land. Columbus comforted them with aſſurances of ſucceſs, and the proſpect of vaſt wealth, in thoſe opulent regions whither he was conducting them. He regulated every thing by his ſole authority; he ſuperintended the execution of every order; and allowing himſelf only a few hours for ſleep, he was at all other times upon deck. As his courſe lay through ſeas which had not formerly been viſited, the ſounding-line, or inſtruments for obſervation, were continually in his hands. After the example of the Portugueſe diſcoverers, he attended to the motion of tides and currents, watched the flight of birds, the appearance of fiſhes, of ſea-weeds, and of every thing that floated on the waves, and entered every occurrence, with a minute exactneſs, in the journal which he kept. As the length of the voyage could not fail of alarming ſailors habituated only to ſhort excurſions, Columbus endeavoured to conceal from them the real progreſs which they made. With this view, though they run 18 leagues on the ſecond day after they left Gomera, he gave out that they had advanced only 15, and he uniformly employed the ſame artifice of reckoning ſhort during the whole voyage. By the 14th of September, the fleet was above 200 leagues to the weſt of the Canary iſles, at a greater diſtance from land than any Spaniard had been before that time. 120

Aſtoniſhment occaſioned by obſerving the variation of the compaſs.

There they were ſtruck with an appearance no leſs aſtoniſhing than new. They obſerved that the magnetic needle, in their compaſſes, did not point exactly to the polar ſtar, but varied towards the weſt; and as they proceeded, this variation increaſed. This appearance, which is now familiar, though it ſtill remains one of the myſteries of nature, into the cauſe of which the ſagacity of man hath not been able to penetrate, filled the companions of Columbus with terror. They were now in a boundleſs unknown ocean, far from the uſual courſe of navigation; nature itſelf ſeemed to be altered, and the only guide which they had left was about to fail them. Columbus, with no leſs quickneſs than ingenuity, invented a reaſon for this appearance, which, though it did not ſatiſfy himſelf, ſeemed ſo plauſible to them, that it diſpelled their fears, or ſilenced their murmurs.

He ſtill continued to ſteer due weſt, nearly in the ſame latitude with the Canary iſlands. In this courſe he came within the ſphere of the trade-wind, which blows invariably from eaſt to weſt, between the tropics and a few degrees beyond them. He advanced before this ſteady gale with ſuch uniform rapidity, that it was ſeldom neceſſary to ſhift a ſail. When about 400 leagues to the weſt of the Canaries, he found the ſea ſo covered with weeds, that it reſembled a meadow of vaſt extent; and in ſome places they were ſo thick, as to retard the motion of the veſſels. This ſtrange appearance occaſioned new alarm and diſquiet. The ſailors imagined that they were now arrived at the utmoſt boundary of the navigable ocean; that theſe floating weeds would obſtruct their farther progreſs, and concealed dangerous rocks, or ſome large tract of land, which had ſunk, they knew not how, in that place. Columbus endeavoured to perſuade them, that what had alarmed, ought rather to have encouraged them, and was to be conſidered as a ſign of approaching land. At the ſame time, a briſk gale aroſe, and carried them forward. Several birds were ſeen hovering about the ſhip.

America. and directed their flight towards the weft. The defponding crew refumed fome degree of fpirit, and began to entertain frefh hopes.

Upon the firft of October they were, according to the admiral's reckoning, 770 leagues to the weft of the Canaries; but left his men fhould be intimidated by the prodigious length of the navigation, he gave out that they had proceeded only 584 leagues; and, fortunately for Columbus, neither his own pilot, nor thofe of the other fhips, had fkill fufficient to correct this error, and difcover the deceit. They had now been above three weeks at fea; they had proceeded far beyond what former navigators had attempted or deemed poffible; all their prognoftics of difcovery, drawn from the flight of birds and other circumftances, had proved fallacious; the appearances of land, with which their own credulity or the artifice of their commander had from time to time flattered and amufed them, had been altogether illufive, and their profpect of fuccefs feemed now to be as diftant as ever. Thefe reflections occurred often to men, who had no other object or occupation, than to reafon and difcourfe concerning the intention and circumftances of their expedition. They made impreffion at firft upon the ignorant and timid, and extending by degrees to fuch as were better informed or more refolute, the contagion fpread at length from fhip to fhip. From fecret whifpers or murmurings, they proceeded to open cabals and public complaints. They taxed their fovereign with inconfiderate credulity, in paying fuch regard to the vain promifes and rafh conjectures of an indigent foreigner, as to hazard the lives of fo many of her own fubjects, in profecuting a chimerical fcheme. They affirmed that they had fully performed their duty, by venturing fo far in an unknown and hopelefs courfe, and could incur no blame, for refufing to follow, any longer, a defperate adventurer to certain deftruction. They contended, that it was neceffary to think of returning to Spain, while their crazy veffels were ftill in a condition to keep the fea, but expreffed their fears that the attempt would prove vain, as the wind, which had hitherto been fo favourable to their courfe, muft render it impoffible to fail in the oppofite direction. All agreed that Columbus fhould be compelled by force to adopt a meafure on which their common fafety depended. Some of the more audacious propofed, as the moft expeditious and certain method for getting rid at once of his remonftrances, to throw him into the fea; being perfuaded that, upon their return to Spain, the death of an unfuccefsful projector would excite little concern, and be inquired into with no curiofity.

121 Perilous fituation of Columbus.

Columbus was fully fenfible of his perilous fituation. He had obferved, with great uneafinefs, the fatal operation of ignorance and of fear in producing difaffection among his crew; and faw that it was now ready to burft out into open mutiny. He retained, however, perfect prefence of mind. He affected to feem ignorant of their machinations. Notwithftanding the agitation and folicitude of his own mind, he appeared with a cheerful countenance; like a man fatisfied with the progrefs which he had made, and confident of fuccefs. Sometimes he employed all the arts of infinuation to foothe his men. Sometimes he endeavoured to work upon their ambition or avarice, by magnificent defcriptions of the fame and wealth which they were about to acquire. On other occafions, he affumed a tone of authority, and threatened them with vengeance from their fovereign, if, by their daftardly behaviour, they fhould defeat this noble effort to promote the glory of God, and to exalt the Spanifh name above that of every other nation. Even with feditious failors, the words of a man whom they had been accuftomed to reverence were weighty and perfuafive; and not only reftrained them from thofe violent exceffes which they meditated, but prevailed with them to accompany their admiral for fome time longer.

As they proceeded, the indications of approaching land feemed to be more certain, and excited hope in proportion. The birds began to appear in flocks, making towards the fouth-weft. Columbus, in imitation of the Portuguefe navigators, who had been guided in feveral of their difcoveries by the motion of birds, altered his courfe from due weft towards that quarter whither they pointed their flight. But after holding on for feveral days in this new direction without any better fuccefs than formerly, having feen no object during 30 days but the fea and the fky, the hopes of his companions fubfided fafter than they had rifen; their fears revived with additional force; impatience, rage, and defpair, appeared in every countenance. All fenfe of fubordination was loft. The officers, who had hitherto concurred with Columbus in opinion, and fupported his authority, now took part with the private men: they affembled tumultuoufly on the deck, expoftulated with their commander, mingled threats with their expoftulations, and required him inftantly to tack about and to return to Europe. Columbus perceived that it would be of no avail to have recourfe to any of his former arts, which having been tried fo often had loft their effect; and that it was impoffible to rekindle any zeal for the fuccefs of the expedition among men in whofe breafts fear had extinguifhed every generous fentiment. He faw that it was no lefs vain to think of employing either gentle or fevere meafures, to quell a mutiny fo general and fo violent. It was neceffary, on all thefe accounts, to foothe paffions which he could no longer command, and to give way to a torrent too impetuous to be checked. He promifed folemnly to his men that he would comply with their requeft, provided they would accompany him, and obey his commands for three days longer; and if, during that time, land were not difcovered, he would then abandon the enterprife, and direct his courfe towards Spain.

122 His crews ready to mutiny.

Enraged as the failors were, and impatient to turn their faces again towards their native country, this propofition did not appear to them unreafonable. Nor did Columbus hazard much in confining himfelf to a term fo fhort. The prefages of difcovering land were now fo numerous and promifing, that he deemed them infallible. For fome days the founding line reached the bottom, and the foil which it brought up indicated land to be at no great diftance. The flocks of birds increafed; and were compofed not only of fea fowl, but of fuch land birds as could not be fuppofed to fly far from the fhore. The crew of the Pinta obferved a cane floating which feemed to be newly cut, and likewife a piece of timber artificially carved. The failors aboard the Nigna took up the branch of a tree with red berries perfectly frefh. The clouds around the fetting fun affumed a new appearance; the air was more

America. more mild and warm; and, during night, the wind became unequal and variable. From all these symptoms, Columbus was so confident of being near land, that on the evening of the 11th of October, after public prayers for success, he ordered the sails to be furled, and the ships to lie by, keeping strict watch, lest they should be driven ashore in the night. During this interval of suspence and expectation, no man shut his eyes, all kept upon deck, gazing intently towards that quarter where they expected to discover the land which had been so long the object of their wishes.

123 Their joy on descrying coast. About two hours before midnight, Columbus standing on the forecastle, observed a light at a distance, and privately pointed it out to Pedro Guttierez, a page of the queens wardrobe. Guttierez perceived it; and calling to Salcedo comptroller of the fleet, all three saw it in motion, as if it were carried from place to place. A little after midnight, the joyful sound of *Land! land!* was heard from the Pinta, which kept always a-head of the other ships. But having been so often deceived by fallacious appearances, every man was now become slow of belief; and waited, in all the anguish of uncertainty and impatience, for the return of day. As soon as morning dawned, all doubts and fears were dispelled. From every ship an island was seen about two leagues to the north, whose flat and verdant fields, well stored with wood, and watered with many rivulets, presented the aspect of a delightful country. The crew of the Pinta instantly began the *Te Deum*, as a hymn of thanksgiving to God; and were joined by those of the other ships, with tears of joy and transports of congratulation. This office of gratitude to Heaven was followed by an act of justice to their commander. They threw themselves at the feet of Columbus, with feelings of self-condemnation mingled with reverence. They implored him to pardon their ignorance, incredulity, and insolence, which had created him so much unnecessary disquiet, and had so often obstructed the prosecution of his well-concerted plan; and passing, in the warmth of their admiration, from one extreme to another, they now pronounced the man whom they had so lately reviled and threatened, to be a person inspired by Heaven with sagacity and fortitude more than human, in order to accomplish a design so far beyond the ideas and conception of all former ages.

As soon as the sun arose, all their boats were manned and armed. They rowed towards the island with their colours displayed, with warlike music, and other martial pomp. As they approached the coast, they saw it covered with a multitude of people, whom the novelty of the spectacle had drawn together, whose attitudes and gestures expressed wonder and astonishment at the strange objects which presented themselves to their view. Columbus was the first European who set foot in the New World which he had discovered. He landed in a rich dress, and with a naked sword in his hand. His men followed; and, kneeling down, they all kissed the ground which they had so long desired to see. They next erected a crucifix; and, prostrating themselves before it, returned thanks to God for conducting their voyage to such an happy issue.

124 They land in one of the islands of the New World.

The above was one of the Bahama islands; to which he gave the name of *San Salvador*, and took possession of it in the name of their Catholic majesties. In this first voyage he discovered several other of the Lucayo or Bahama islands, with those of Cuba and Hispaniola. The natives considered the Spaniards as divinities, and the discharge of the artillery as their thunder: they fell prostrate at the sound. The women, however, offered their favours, and courted the embraces of their new guests as men. Their husbands were not jealous of them; and in the arms of those wantons the companions of Columbus are said to have caught that malady which directs its poison to the springs of life. In a second voyage many new islands were discovered. In a third, he attained the great object of his ambition, by discovering the continent of America, near the mouth of the river Oroonoko, on the first day of August 1498. His success produced a crowd of adventurers from all nations; but the year before this, the northern continent had been discovered by Sebastian Cabot in the service of Henry VII. of England. 125 The continent afterwards discovered.

Notwithstanding the many settlements of the Europeans in this continent, great part of America remains still unknown. The northern continent contains the British colonies of Hudson's Bay, Canada, Nova Scotia, New England, New York, New Jersey, Pensylvania, Maryland, Virginia, North and South Carolina, Georgia, East and West Florida. It contains also the Spanish territories of Louisiana, New Mexica, California, and Mexico. Besides these, there are immense regions to the west and north, the boundaries of which have never yet been discovered. In such as are in any degree known, dwell the Esquimaux, the Algonquins, the Hurons, the Iroquois, the Cherokees, the Chikasaws, and many other tribes of Indians. In the southern continent lie the Spanish provinces of Terra Firma, Guiana, Peru, Paraguy, and Chili; together with that of Brasil, belonging to the Portuguese; and the country of Surinam, belonging to the Dutch. Vast tracts, however, in the inland parts, are unknown, being comprehended under the general name of *Amazonia*. A large district also, said to be the residence of a gigantic race of men, lies on the east side of the continent, between the straits of Magellan and the province of Paraguay. See PATAGONIA. 126 Division of America.

This vast country produces most of the metals, minerals, plants, fruits, trees, and wood, to be met with in the other parts of the world, and many of them in greater quantities and high perfection. The gold and silver of America have supplied Europe with such immense quantities of those valuable metals, that they are become vastly more common; so that the gold and silver of Europe now bears little proportion to the high price set upon them before the discovery of America. 127 Its productions.

It also produces diamonds, pearls, emeralds, amethysts, and other valuable stones, which, by being brought into Europe, have contributed likewise to lower their value. To these, which are chiefly the production of Spanish America, may be added a great number of other commodities, which, though of less price, are of much greater use; and many of them make the ornament and wealth of the British empire in this part of the world. Of these are the plentiful supplies of cochineal, indigo, anatto, logwood, brazil, fustic, pimento, lignum vitæ, rice, ginger, cocoa, or the chocolate nut, sugar, cotton, tobacco, banillas, red-wood, the balsams of Tolu, Peru, and Chili, that

America.

valuable article in medicine the Jesuit's bark, mechoacan, saffafras, sarsaparilla, cassia, tamarinds, hides, furs, ambergrise, and a great variety of woods, roots, and plants; to which, before the discovery of America, we were either entire strangers, or forced to buy at an extravagant rate from Asia and Africa, through the hands of the Venetians and Genoese, who then engrossed the trade of the eastern world.

On this continent there grows also a variety of excellent fruits; as pine-apples, pomegranates, citrons, lemons, oranges, malicatons, cherries, pears, apples, figs, grapes, great numbers of culinary, medicinal, and other herbs, roots, and plants, with many exotic productions which are nourished in as great perfection as in their native soil.

128
The different possessors of America.

Although the Indians still live in the quiet possession of many large tracts, America, so far as known, is chiefly claimed, and divided into colonies, by three European nations, the Spaniards, English, and Portuguese. The Spaniards, as they first discovered it, have the largest and richest portion, extending from New Mexico and Louisiana in North America, to the Straits of Magellan in the South Sea, excepting the large province of Brasil, which belongs to Portugal; for though the French and Dutch have some forts upon Surinam and Guiana, they scarcely deserve to be considered as proprietors of any part of the southern continent.

Next to Spain, the most considerable proprietor of America was Great Britain, who derived her claim to North America from the first discovery of that continent by Sebastian Cabot in the name of Henry VII. *anno* 1497, about six years after the discovery of South America by Columbus in the name of the king of Spain. This country was in general called *Newfoundland;* a name which is now appropriated solely to an island upon its coast. It was a long time before we made an attempt to settle in this country. Sir Walter Raleigh, an uncommon genius and a brave commander, first showed the way, by planting a colony in the southern part, which he called *Virginia*, in honour of his mistress Queen Elizabeth.

The French indeed, from this period until the conclusion of the war before last, laid a claim to, and actually possessed, Canada and Louisiana; comprehending all that extensive inland country reaching from Hudson's Bay on the north, to Mexico and the gulph of the same name on the south But in that war, to which their perfidy and ambition gave rise, they were not only driven from Canada and its dependencies, but obliged to relinquish all that part of Louisiana lying on the east side of the Missisippi, as related under the *History of* BRITAIN. And thus our colonies were preserved, secured, and extended so far, as to render it difficult to ascertain the precise bounds of our empire in North America. To the northward we might have extended our claims quite to the pole itself, nor did any nation seem inclined to dispute the property of this northernmost country with us. From that extremity we had a territory extending southward to Cape Florida in the Gulph of Mexico, N. Lat 25′, and consequently near 4000 miles long in a direct line. And to the westward, our boundaries reached to nations unknown even to the Indians of Canada.

129
Vast extent of the British possessions before the late revolution.

Of the revolution that has since taken place, by which a great part of those territories have been torn from the British empire, the history follows in the next article.

130
Rise of the American republic.

AMERICA (*United States of*). Of the rise and establishment of this republic, which has given a new face to the western world, a succinct and impartial narrative shall in this article be attempted; in which, however, we cannot hope entirely to avoid errors, as they are perhaps unavoidable The accounts from which the historian must derive his information are not yet cleared from the mistakes of prejudice and the fabrications of party; when they differ, their comparative authenticity is with difficulty ascertained; and they want above all that softening which they can receive from time alone.

The beginning of every political establishment is contemptible. Some few banditti taking refuge among the marshes on the banks of the Tiber, laid the foundation of the Roman empire. The turbulence of some North Americans, and the blunders of some British statesmen, gave birth to this new republic, which at a future period, it has been fancied, may perhaps surpass even the splendor of Rome.

131
State and character of the British colonies at the end of the war 1763.

The state of the British colonies at the conclusion of the war in 1763, was such as attracted the attention of all the politicians in Europe. Their flourishing condition at that period was remarkable and striking: their trade had prospered in the midst of all the difficulties and distresses of a war in which they were so nearly and so immediately concerned. Their population continued on the increase, notwithstanding the ravages and depredations that had been so fiercely carried on by the French, and the native Indians in their alliance. They abounded with spirited and active individuals of all denominations. They were flushed with the uncommon prosperity that had attended them in their commercial affairs and military transactions. Hence they were ready for all kind of undertakings, and saw no limits to their hopes and expectations.

As they entertained the highest opinion of their value and importance, and of the immense benefit that Britain derived from its connection with them, their notions were adequately high in their own favour. They deemed themselves, not without reason, intitled to every kindness and indulgence which the mother-country could bestow.

Although their pretensions did not amount to a perfect equality of advantages and privileges in matters of commerce, yet in those of government they thought themselves fully competent to the task of conducting their domestic concerns with little or no interference from abroad. Though willing to admit the supremacy of Great Britain, they viewed it with a suspicious eye, and with a marked desire and intent speedily to give it limitations.

Their improvements in all the necessary and useful arts did honour to their industry and ingenuity. Though they did not live in the luxury of Europe, they had all the solid and substantial enjoyments of life, and were not unacquainted with many of its elegancies and refinements.

A circumstance much to their praise is, that notwithstanding their peculiar addiction to those occupations of which lucre is the sole object, they were duly attentive to cultivate the field of learning; and they have ever since their first foundation been particularly careful to provide for the education of the rising progeny.

Their

Their vaſt augmentation of internal trade and external commerce, was not merely owing to their poſition and facility of communication with other parts; it aroſe alſo from their natural turn and temper, full of ſchemes and projects; ever aiming at new diſcoveries, and continually employed in the ſearch of means of improving their condition.

Their condition carried them into every quarter from whence profit could be derived. There was ſcarcely any port of the American hemiſphere to which they had not extended their navigation. They were continually exploring new ſources of trade, and were found in every ſpot where buſineſs could be tranſacted.

To this extenſive and inceſſant application to commerce, they added an equal vigilance in the adminiſtration of their affairs at home. Whatever could conduce the amelioration of the ſoil they poſſeſſed, to the progreſs of agriculture, or to the improvement of their domeſtic circumſtances, was attended to with ſo much labour and care, that it may be ſtrictly ſaid, that Nature had given them nothing of which they did not make the moſt.

In the midſt of this ſolicitude and toil in matters of buſineſs, the affairs of government were conducted with a ſteadineſs, prudence, and lenity, ſeldom experienced, and never exceeded, in the beſt regulated countries of Europe.

Such was the ſituation of the Britiſh colonies in general throughout North America, and of the New England provinces in particular, when the pacification above mentioned opened one of the moſt remarkable ſcenes that ever commanded the attention of the world.

132 Intrigues of the French.

The French, who have for many ages been the profeſt and natural enemies of Britain, had long viewed, with equal envy and apprehenſion, the flouriſhing ſtate of thoſe colonies ſhe had founded in North America. No doubt at preſent ſubſiſts, that they began immediately after the peace of Paris to carry into execution the ſcheme they had formed for the ſeparation of the Britiſh colonies from the mother-country.

Conſcious that, whilſt a good underſtanding laſted between them, the ſuperiority muſt henceforth remain for ever on the ſide of Britain, it was only by their diſunion that France could hope to regain the ſtation and conſequence ſhe had formerly poſſeſſed in Europe.

The firſt ſteps ſhe took were to employ her ſecret emiſſaries in ſpreading diſſatisfaction among the Britiſh coloniſts; and the effects produced by her machinations were preciſely ſuch as they had intended and expected. The diſpoſition of the inhabitants of North America began gradually to alter from that warmth of attachment to the mother-country which had ſo peculiarly characteriſed them. They began to view her rather in the light of a ſovereign than of a parent; and to examine, with a ſcrupulous nicety, the nature of thoſe ties that rendered them parts of her empire.

133 Taxes laid on goods imported into the colonies, and the obnoxious acts framed;

In March 1764, a bill was paſſed, by which heavy duties were laid on goods imported by the coloniſts from ſuch Weſt India iſlands as did not belong to Great Britain; at the ſame time that theſe duties were to be paid into the exchequer in ſpecie: and in the ſame ſeſſion, another bill was framed to reſtrain the currency of paper-money in the colonies themſelves. Theſe acts coming ſo cloſe upon each other, threw the whole continent into the utmoſt ferment. Vehement remonſtrances were made to the miniſtry, and every argument made uſe of that reaſon or ingenuity could ſuggeſt, but to no purpoſe. Their reaſoning, however, convinced a great number of people at home; and thus the American cauſe came to be conſidered as the cauſe of liberty.

134 Which exaſperate the Americans.

The Americans, finding all argumentation vain, at laſt united in an agreement to import no more of the manufactures of Great Britain, but to encourage to the utmoſt of their power every thing of that kind among themſelves. Thus the Britiſh manufacturers alſo became a party againſt miniſtry, and did not fail to expreſs their reſentment in the ſtrongeſt terms; but the miniſtry were not to be ſo eaſily daunted, and therefore proceeded to the laſt ſtep of their intended plan, which was to lay on ſtamp duties throughout the continent. Previous to this, indeed, ſeveral regulations were paſſed in favour of the commerce of the colonies; but they had now imbibed ſuch unfavourable ſentiments of the Britiſh miniſtry, that they paid very little regard to any thing pretended to be done in their favour; or if theſe acts made any favourable impreſſion, it was quickly obliterated by the news of the ſtamp-act. The reaſon given for this act ſo exceedingly obnoxious was, that a ſum might be raiſed ſufficient for the defence of the colonies againſt a foreign enemy; but this pretence was ſo far from giving any ſatisfaction to the Americans, that it excited their indignation to the utmoſt degree. They not only aſſerted that they were abundantly able to defend themſelves againſt any foreign enemy, but denied that the Britiſh parliament had any right to tax them at all.

135 The ſtamp-act framed.

It would be ſuperfluous to enter into any arguments uſed by the contending parties on this important occaſion. It was evident that the matter was not to be decided by argument but by force of arms; and the Britiſh miniſtry, too confident of the authority and power of this country, determined to carry on matters with an high hand, to terrify the coloniſts into an implicit ſubjection, or, if that would not do, to compel them to it by force. The ſtamp-act, after a violent oppoſition in parliament, was paſſed, and its reception in America was ſuch as might have been expected. The news, and the act itſelf, firſt arrived at Boſton, where the bells were muffled and rung a funeral peal. The act was firſt hawked about the ſtreets with a Death's head affixed to it, and ſtyled the "Folly of England, and the Ruin of America;" and afterwards publicly burnt by the enraged populace: The ſtamps themſelves were ſeized and deſtroyed, unleſs brought by men of war, or kept in fortified places; thoſe who were to receive the ſtamp duties were compelled to reſign their offices; and ſuch of the Americans as ſided with government on this occaſion, had their houſes plundered and burnt.

136 Received with univerſal indignation in America.

Though theſe outrages were committed by the loweſt of the multitude, they were firſt connived at by thoſe of ſuperior rank, and the principles on which they were founded afterwards openly patronized by them; and the doctrine became general and openly avowed, that Britain had no right whatever to tax the colonies without their own conſent.

It was now found abſolutely neceſſary either to yield to the Americans, by repealing the obnoxious ſtatutes, or to enforce them by arms. The ferment had diffuſed

America. itſelf univerſally throughout the colonies. Virginia firſt, and after that all the reſt of the provinces, declared againſt the right of Britain to lay on taxes in America; and that every attempt to veſt others with this power beſides the king, or the governor of the province and his general aſſembly, was illegal, unconſtitutional, and unjuſt. Non-importation agreements were every where entered into; and it was even reſolved to prevent the ſale of any more Britiſh goods after the preſent year. American manufactures, though dearer, as well as inferior in quality to the Britiſh, were univerſally preferred. An aſſociation was entered into againſt eating of lamb, in order to promote the growth of wool; and the ladies with cheerfulneſs agreed to renounce the uſe of every ſpecies of ornament manufactured in Britain. Such a general and alarming confederacy determined the miniſtry to repeal ſome of the moſt obnoxious ſtatutes; and to this they were the more inclined by a petition from the firſt American congreſs, held at New York in the beginning of October 1765.

137 Repealed.

The ſtamp-act was therefore repealed, to the univerſal joy of the Americans, and indeed to the general ſatisfaction of the Engliſh, whoſe manufactures had begun to ſuffer very ſeverely in conſequence of the American aſſociation againſt them. The diſputes on the ſubject without doors, however, were by no means ſilenced, but each party continued to argue the caſe as violently as ever. The celebrated Dr Benjamin Franklin was, on this occaſion, examined before the Houſe of Commons; and his opinion was in ſubſtance as follows:

138 Opinion of Dr Franklin on this ſubject.

"That the tax in queſtion was impracticable and ruinous. The very attempt had ſo far alienated the affection of the colonies, that they behaved in a leſs friendly manner towards the natives of England than before; conſidering the whole nation as conſpiring againſt their liberty, and the parliament as willing rather to oppreſs than to ſupport and aſſiſt them. America, in fact, did not ſtand in any need of Britiſh manufactures, having already begun to conſtruct ſuch as might be deemed abſolutely neceſſary, and that with ſuch ſucceſs, as left no doubt of their arriving in a ſhort time at perfection. The elegancies of dreſs had already been renounced for manufactures of the American kind, though much inferior; and the bulk of the people, conſiſting of farmers, were ſuch as could in no way be affected by the want of Britiſh commodities, as having every neceſſary within themſelves. Materials of all kinds were to be had in plenty: the wool was fine; flax grew in great abundance, and iron was every where to be met with."

The Doctor alſo inſiſted, That "the Americans had been greatly miſrepreſented; that they had been traduced as void of gratitude and affection to the parent ſtate; than which nothing could be more contrary to truth. In the war of 1755 they had, at their own expence, raiſed an army of 25,000 men; and in that of 1739, they aſſiſted the Britiſh expeditions againſt South America with ſeveral thouſand men, and had made many brave exertions againſt the French in North America. It was ſaid that the war of 1755 had been undertaken in defence of the colonies; but the truth was, that it originated from a conteſt about the limits between Canada and Nova Scotia, and in defence of the Engliſh rights to trade on the Ohio. The Americans, however, would ſtill continue to act with their uſual fidelity; and, were any war to break out in which they had no concern, would ſhow themſelves as ready as ever to aſſiſt the parent ſtate to the utmoſt of their power, and would never fail to manifeſt their readineſs in contributing to the emergencies of government, when called to do ſo in a regular and conſtitutional manner."

The miniſtry were conſcious, that in repealing this obnoxious act, they yielded to the Americans; and therefore, to ſupport, as they thought, the dignity of Great Britain, it was judged proper to publiſh a declaratory bill, ſetting forth the authority of the mother country over her colonies, and her power to bind them by laws and ſtatutes *in all caſes whatever*. This much diminiſhed the joy with which the repeal of the ſtamp-act was received in America. It was conſidered as a proper reaſon to enforce any claims equally prejudicial with the ſtamp-act, which might hereafter be ſet up; a ſpirit of jealouſy pervaded the whole continent, and a ſtrong party was formed, watchful on every occaſion to guard againſt the ſuppoſed encroachments of the Britiſh power. 139 Declaratory bill gives offence in America.

140 Aſſembly of New York diſobeys an act of parliament.

It was not long before an occaſion offered, in which the Americans manifeſted a ſpirit of abſolute independency; and that, inſtead of being bound by the Britiſh legiſlature in all caſes, they would not be controlled by it in the moſt trivial affairs. The Rockingham miniſtry had paſſed an act, providing the troops ſtationed in different parts of the colonies with ſuch accommodations as were neceſſary for them. The aſſembly of New York, however, took upon them to alter the mode of execution preſcribed by the act of parliament, and to ſubſtitute one of their own. This gave very great offence to the new miniſtry, and rendered them, though compoſed of thoſe who had been active againſt the ſtamp-bill, leſs favourable to the colonies than in all probability they would have otherwiſe been. An unlucky circumſtance at the ſame time occurred, which threw every thing once more into confuſion. One of the new miniſtry, Mr Charles Townſhend, having declared that he could find a way of taxing the Americans without giving them offence, was called upon to propoſe his plan. This was by impoſing a duty upon tea, paper, painters colours, and glaſs imported into America. The undutiful behaviour of the New York aſſembly, and that of Boſton, which had proceeded in a ſimilar manner, cauſed this bill to meet with leſs oppoſition than otherwiſe it might have done. As a puniſhment to the refractory aſſemblies, the legiſlative power was taken from that of New-York, until it ſhould fully comply with the terms of the act. That of Boſton at laſt ſubmitted with reluctance. The bill for the new taxes was quickly paſſed, and ſent to America in 1768. 141 Mr Townſhend's plan to tax America,

142 Is received there with ſtill greater indignation than even the ſtamp act.

A ferment much greater than that occaſioned by the ſtamp-act now took place throughout the continent. The populace renewed their outrages, and thoſe of ſuperior ſtation entered into regular combinations againſt it. Circular letters were ſent from Maſſachuſet's colony to all the reſt, ſetting forth the injuſtice and impropriety of the behaviour of the Britiſh legiſlature. Meetings were held in all the principal towns, in which it was propoſed to leſſen the conſumption of foreign manufactures, by giving proper encouragement to their own.

own. Continual diſputes enſued betwixt the governors and general aſſemblies of their provinces, which were

143 Quarrel between the people of Maſſachuſet's Bay and their governor.

much heightened by a letter from Lord Shelburn to governor Bamand of Maſſachuſet's bay, containing complaints of the people he governed. The aſſembly, exaſperated to the higheſt degree, charged their governor with having miſrepreſented them to the court of Britain, required him to produce copies of the letters he had ſent; and, on his refuſal, wrote letters to the Engliſh miniſtry, accuſing him of miſrepreſentation and partiality, complaining at the ſame time moſt grievouſly of the proceedings of parliament, as utterly ſubverſive of the liberties of America, and the rights of Britiſh ſubjects.

The governor, at a loſs how to defend himſelf, prorogued the aſſembly; and, in his ſpeech on the occaſion, gave a looſe to his reſentment, accuſing the members of ambitious deſigns, incompatible with thoſe of dutiful and loyal ſubjects. To counteract the circular letter of the province of Maſſachuſet's Bay, Lord Hillſborough, ſecretary for the American department, ſent another to the governors of the different colonies, reprobating the other as full of miſrepreſentation, and tending to excite a rebellion againſt the authority of the parent ſtate.

Matters now haſtened to a criſis. The governor had been ordered to proceed with vigour, and by no means to ſhow any diſpoſition to yield to the people as formerly.

144 He requires the aſſembly to reſcind their circular letter;

In particular, they were required to reſcind that reſolution by which they had written the circular letter above mentioned; and, in caſe of a refuſal, it was told them that they would be diſſolved. As this letter had been framed by the reſolutions of a former Houſe, they deſired, after a week's conſultation, that a receſs might be granted to conſult with their conſtituents; but this being refuſed, they came to a determina-

145 Which they refuſe.

tion, 92 againſt 17, to adhere to the reſolution which produced the circular letter. At the ſame time a letter was ſent to Lord Hillſborough, and a meſſage to the governor, in juſtification of their proceedings. In both, they expreſſed themſelves with ſuch freedom as was by no means calculated to accord with the ſentiments of thoſe in power. They inſiſted that they had a right to communicate their ſentiments to their fellow-ſubjects upon matters of ſuch importance; complained of the requiſition to reſcind the circular letter as unconſtitutional and unjuſt; and particularly inſiſted, that they were repreſented as harbouring ſeditious deſigns, when they were doing nothing but what was lawful and right. At the ſame time, they condemned the

146 Accuſe their governor, and petition for his removal.

late acts of parliament as highly oppreſſive, and ſubverſive of liberty. The whole was concluded by a liſt of accuſations againſt their governor, repreſenting him as unfit to continue in his ſtation, and petitioning the king for his removal from it.

These proceedings were followed by a violent tumult

147 A tumult at Boſton.

at Boſton. A veſſel belonging to a capital trader had been ſeized in conſequence of his having neglected ſome of the new regulations; and being taken under the protection of a man of war at that time lying in the harbour, the populace attacked the houſes of the commiſſioners of exciſe, broke their windows, deſtroyed the collector's boats, and obliged the cuſtomhouſe-officers to take refuge in Caſtle William, ſituated at the entrance of the harbour.

The governor now took the laſt ſtep in his power to put a ſtop to the violent proceedings of his aſſembly,

148 The aſſembly diſſolved.

by diſſolving it entirely; but this was of little moment. Their behaviour had been highly approved by the other colonies, who had written letters to them expreſſive of their approbation. After the diſſolution of the aſſembly, frequent meetings of the people were held in Boſton, which ended in a remonſtrance to the governor, to the ſame purpoſe as ſome of the former; but concluding with an extraordinary requeſt, that he would take upon him to order the king's ſhips out of the harbour.

149 The diſturbances ſtill increaſe.

While the diſpoſition of the Boſtonians was thus going on from bad to worſe, news arrived that the agent for the colony had not been allowed to deliver their petition to the king; it having been objected, that the aſſembly without the governor was not ſufficient authority. This did not contribute to allay the

150 Some troops ordered to Boſton.

ferment; and it was further augmented by the news that a number of troops had been ordered to repair to Boſton, to keep the inhabitants in awe.

A dreadful alarm now took place. The people called on the governor to convene a general aſſembly, in order to remove their fears of the military; who they ſaid were to be aſſembled to overthrow their liberties, and force obedience to laws to which they were entirely averſe. The governor replied, that it was no longer in his power to call an aſſembly; having, in his laſt inſtructions from England, been required to wait the king's orders, the matter being then under conſideration at home. Being thus refuſed, the people took upon themſelves the formation of an aſſembly, which

151 The people form an aſſembly, called a *Convention*;

they called a *convention*. The proceedings and reſolutions of this were conformable to their former behaviour; but now they went a ſtep farther, and, under pretence of an approaching rupture with France, ordered the inhabitants to put themſelves in a poſture of defence againſt any ſudden attack of an enemy; and circular letters were directed to all the towns in the province, acquainting them with the reſolutions that had been taken in the capital, and exhorting them to proceed in the ſame manner. The town of Hatfield alone refuſed its concurrence; but this ſerved only to expoſe them to the cenſure and contempt of the reſt. The convention, however, thought proper to aſſure the governor of their pacific intentions, and renewed their requeſt that an aſſembly might be called; but being refuſed any audience, and threatened with being treated as rebels, they at laſt thought proper to

152 Which diſſolves, and endeavours to vindicate its own conduct.

diſſolve of themſelves, and ſent over to Britain a circumſtantial account of their proceedings, with the reaſon of their having aſſembled in the manner already mentioned.

The expected troops arrived on the very day on which the convention broke up, and had ſome houſes in the town fitted up for their reception. Their arrival had a conſiderable influence on the people, and for ſome time ſeemed to put a ſtop to the diſturbances; but the ſeeds of diſcord had now taken ſuch deep root, that it was impoſſible to quench the flame. The late outrageous behaviour in Boſton had given the greateſt of-

153 Both houſes of parliament addreſs the king againſt America.

fence in England; and, notwithſtanding all the efforts of oppoſition, an addreſs from both houſes of parliament was preſented to the king; in which the audacious behaviour of the colony of Maſſachuſet's Bay was

America.

was ſet forth in the moſt ample manner, and the moſt vigorous meaſures recommended for reducing them to obedience. The Americans, however, continued ſtedfaſt in the ideas they had adopted. Though the troops had for ſome time quieted the diſturbances, yet the calm continued no longer than they appeared reſpectable on account of their number; but as ſoon as this was diminiſhed by the departure of a large detachment, the remainder were treated with contempt, and it was even reſolved to expel them altogether. The country people took up arms for this purpoſe, and were to have aſſiſted their friends in Boſton; but before the plot could be put in execution, an event happened which put an end to every idea of reconciliation betwixt the contending parties.

154 Some people killed by the ſoldiers in a mob at Boſton.

On the 5th of March 1770, a ſcuffle happened between ſome ſoldiers and a party of the town's people. The inhabitants poured in from all quarters to the aſſiſtance of their fellow-citizens; a violent tumult enſued, during which the military fired among the mob, killing and wounding ſeveral of them. The whole province now roſe in arms, and the ſoldiers were obliged to retire to Caſtle William to prevent their being cut in pieces. In other reſpects the determinations of the Americans continued, if poſſible, more firm than ever, until at laſt government, determined to act with vigour, and at the ſame time to behave with as much condeſcenſion as poſſible, repealed all the duties lately laid on, that of tea alone excepted.

155 All the duties excepting that on tea taken off;

This was left on purpoſe to maintain the dignity of the crown of Britain; and it was thought that it could not be productive of any diſcontent in America, as being an affair of very little moment, the produce of which was not expected to exceed L. 16,000. The oppoſition, however, were ſtrenuous in their endeavours to get this tax likewiſe abrogated; inſiſting, that the Americans would conſider it only as an inlet to others; and that the repeal of all the reſt, without this, would anſwer no good purpoſe. The event ſhowed that their opinion was well founded.

156 Which is as violently oppoſed as all the reſt.

The Americans oppoſed the tea-tax with the ſame violence as they had done all the reſt: and at laſt, on the news that ſalaries had been ſettled on the juſtices of the ſuperior court of Boſton, the governor was addreſſed on the ſubject; the meaſure was condemned in the ſtrongeſt terms; and a committee ſelected out of the ſeveral diſtricts of the colony appointed to inquire into it.

157 Aſſembly of Maſſachuſet's Bay formally denies the Britiſh right of taxation.

The new aſſembly proceeded in the moſt formal manner to diſavow the ſupremacy of the Britiſh legiſlature; accuſed the parliament of Britain of having violated the natural rights of the Americans in a number of inſtances. Copies of the tranſactions of this aſſembly were tranſmitted to every town in Maſſachuſet, exhorting the inhabitants to rouſe themſelves, and exert every nerve in oppoſition to the iron hand of oppreſſion, which was daily tearing the choiceſt fruits from the fair tree of liberty. The diſturbances were alſo greatly heightened by an accidental diſcovery that Mr Hutchiſon, governor of Maſſachuſet's Bay, had written ſeveral confidential letters to people in power in England, complaining of the behaviour of the province, recommending vigorous meaſures againſt them, and, among other things, aſſerting, that "there muſt be an abridgment of what is called Britiſh liberty."

158 Gov. Hutchiſon's letters to Britiſh miniſtry diſcovered.

Letters of this kind had ſome how or other fallen into the hands of the agent for the colony at London. They were immediately tranſmitted to Boſton, where the aſſembly was ſitting, by whom they were laid before the governor, who was thus reduced to a very mortifying ſituation. Loſing every idea of reſpect or friendſhip for him as their governor, they inſtantly diſpatched a petition to the king, requeſting him to remove the governor and deputy-governor from their places; but to this they not only received no favourable anſwer, but the petition itſelf was declared groundleſs and ſcandalous.

159 The petition againſt him refuſed.

160 Tea deſtroyed at Boſton.

Matters were now ripe for the utmoſt extremities on the part of the Americans; and they were brought on in the following manner. Though the coloniſts had entered into a non-importation agreement againſt tea as well as all other commodities from Britain, it had nevertheleſs found its way into America, though in ſmaller quantities than before. This was ſenſibly felt by the Eaſt-India Company, who had now agreed to pay a large ſum annually to government; in recompence for which compliance, and to make up their loſſes in other reſpects, they were empowered to export their tea from any duty payable in Britain; and in conſequence of this permiſſion, ſeveral ſhips freighted with the commodity were ſent to North America, and proper agents appointed for diſpoſing of it. The Americans now perceiving that the tax was thus likely to be enforced whether they would or not, determined to take every poſſible method to prevent the tea from being landed, as well knowing that it would be impoſſible to hinder the ſale ſhould the commodity once be brought on ſhore. For this purpoſe the people aſſembled in great numbers, forcing thoſe to whom the tea was conſigned to reſign their offices, and to promiſe ſolemnly never to reſume them; and committees were appointed to examine the accounts of merchants, and make public teſts, declaring ſuch as would not take them enemies to their country. Nor was this behaviour confined to the colony of Maſſachuſet's Bay; the reſt of the provinces entered into the conteſt with the ſame warmth, and manifeſted the ſame reſolution to oppoſe the mother country.

In the midſt of this confuſion three ſhips laden with tea arrived at Boſton; but ſo much were the captains alarmed at the diſpoſition which ſeemed to prevail among the people, that they offered, providing they could obtain the proper diſcharges from the tea-conſignees, cuſtomhouſe, and governor, to return to Britain without landing their cargoes. The parties concerned, however, though they durſt not order the tea to be landed, refuſed to grant the diſcharges required. The ſhips, therefore, would have been obliged to remain in the harbour; but the people, apprehenſive that if they remained there the tea would be landed in ſmall quantities and diſpoſed of in ſpite of every endeavour to prevent it, reſolved to deſtroy it at once. This reſolution was executed with equal ſpeed and ſecrecy. The very evening after the above-mentioned diſcharges had been refuſed, a number of people dreſſed like Mohawk Indians boarded the ſhips, and threw into the ſea their whole cargoes, conſiſting of 342 cheſts of tea; after which they retired without making any further diſturbance, or doing any more damage. No tea was deſtroyed in other places, though the ſame ſpirit was every where manifeſted. At Philadelphia the

the pilots were enjoined not to conduct the veſſels up the river; and at New York, though the governor cauſed ſome tea to be landed under the protection of a man of war, he was obliged to deliver it up to the cuſtody of the people, to prevent its being ſold.

161 nd refuſed admittance in other places.

The deſtruction of the tea at Boſton, which happened in November 1773, was the immediate prelude to the diſaſters attending civil diſcord. Government finding themſelves every where inſulted and deſpiſed, reſolved to enforce their authority by all poſſible means; and as Boſton had been the principal ſcene of the riots and outrages, it was determined to puniſh that city in an exemplary manner. Parliament was acquainted by a meſſage from his majeſty with the undutiful behaviour of the city of Boſton, as well as of all the colonies, recommending at the ſame time the moſt vigorous and ſpirited exertions to reduce them to obedience. The parliament in its addreſs promiſed a ready compliance; and indeed the Americans, by their outrageous behaviour, had now loſt many of their partiſans.

162 Puniſhment of Boſton reſolved on.

It was propoſed to lay a fine on the town of Boſton equal to the price of the tea which had been deſtroyed, and to ſhut up its port by armed veſſels until the refractory ſpirit of the inhabitants ſhould be ſubdued; which it was thought muſt quickly yield, as a total ſtop would thus be put to their trade.

163 Arguments and petitions againſt it.

The bill was ſtrongly oppoſed on the ſame grounds that the other had been; and it was predicted, that inſtead of having any tendency to reconcile or ſubdue the Americans, it would infallibly exaſperate them beyond any poſſibility of reconciliation. The petitions againſt it, preſented by the colony's agent, pointed out the ſame conſequence in the ſtrongeſt terms, and in the moſt poſitive manner declared that the Americans never would ſubmit to it; but ſuch was the infatuation attending every rank and degree of men, that it never was imagined the Americans would dare to reſiſt the parent ſtate openly, but would in the end ſubmit implicitly to her commands.

164 And for the impartial adminiſtration of juſtice.

In this confidence a third bill was propoſed for the impartial adminiſtration of juſtice on ſuch perſons as might be employed in the ſuppreſſion of riots and tumults in the province of Maſſachuſet's Bay. By this act it was provided, that ſhould any perſons acting in that capacity be indicted for murder, and not able to obtain a fair trial in the province, they might be ſent by the governor to England, or to ſome other colony, if neceſſary, to be tried for the ſuppoſed crime.

165 Quebec bill.

Theſe three bills having paſſed ſo eaſily, the miniſtry propoſed a fourth, relative to the government of Canada; which, it was ſaid, had not yet been ſettled on any proper plan. By this bill the extent of that province was greatly enlarged; its affairs were put under the direction of a council in which Roman Catholics were to be admitted; the Roman Catholic clergy were ſecured in their poſſeſſions and the uſual perquiſites from thoſe of their own profeſſion. The council above mentioned were to be appointed by the crown; to be removable at its pleaſure; and to be inveſted with every legiſlative power excepting that of taxation.

166 Theſe acts exaſperate the Americans.

No ſooner were theſe laws made known in America, than they cemented the union of the colonies almoſt beyond any poſſibility of diſſolving it. The aſſembly of Maſſachuſet's Bay had paſſed a vote againſt the judges accepting ſalaries from the crown, and put the queſtion, Whether they would accept them as uſual from the general aſſembly? Four anſwered in the affirmative; but Peter Oliver the chief-juſtice refuſed. A petition againſt him, and an accuſation, were brought before the governor; but the latter refuſed the accuſation, and declined to interfere in the matter; but as they ſtill inſiſted for what they called juſtice againſt Mr Oliver, the governor thought proper to put an end to the matter by diſſolving the aſſembly.

167 Reſentment occaſioned by the port-bill.

In this ſituation of affairs a new alarm was occaſioned by the news of the port-bill. This had been totally unexpected, and was received with the moſt extravagant expreſſions of diſpleaſure among the populace; and while theſe continued, the new governor, General Gage, arrived from England. He had been choſen to this office on account of his being well acquainted in America, and generally agreeable to the people; but human wiſdom could not now point out a method by which the flame could be allayed. The firſt act of his office as governor was to remove the aſſembly to Salem, a town 17 miles diſtant, in conſequence of the late act. When this was intimated to the aſſembly, they replied by requeſting him to appoint a day of public humiliation for deprecating the wrath of heaven, but met with a refuſal.

168 Proceedings of the general aſſembly met at Salem.

When met at Salem, they paſſed a reſolution, declaring the neceſſity of a general congreſs compoſed of delegates from all the provinces, in order to take the affairs of the colonies at large into conſideration; and five gentlemen, remarkable for their oppoſition to the Britiſh meaſures, were choſen to repreſent that of Maſſachuſet's Bay. They then proceeded with all expedition to draw up a declaration, containing a detail of the grievances they laboured under, and the neceſſity of exerting themſelves againſt lawleſs power; they ſet forth the diſregard ſhown to their petitions, and the attempts of Great Britain to deſtroy their ancient conſtitution; and concluded with exhorting the inhabitants of the colony to obſtruct, by every method in their power, ſuch evil deſigns, recommending at the ſame time a total renunciation of every thing imported from Great Britain till a redreſs of grievances could be procured.

169 Generoſity of the people of Salem to thoſe of Boſton.

Intelligence of this declaration was carried to the governor on the very day that it was completed; on which he diſſolved the aſſembly. This was followed by an addreſs from the inhabitants of Salem in favour of thoſe of Boſton, and concluding with theſe remarkable words: "By ſhutting up the port of Boſton, ſome imagine that the courſe of trade might be turned hither, and to our benefit; but nature, in the formation of our harbour, forbids our becoming rivals in commerce with that convenient mart; and were it otherwiſe, we muſt be dead to every idea of juſtice, loſt to all feelings of humanity, could we indulge one thought to ſeize on wealth, and raiſe our fortunes on the ruin of our ſuffering neighbours."

It had been fondly hoped by the miniſterial party at home, that the advantages which other towns of the colony might derive from the annihilation of the trade of Boſton, would make them readily acquieſce in the meaſure of ſhutting up that port, and rather rejoice in it than otherwiſe; but the words of the addreſs above mentioned ſeemed to preclude all hope of this

America.

kind ; and ſubſequent tranſactions ſoon manifeſted it to be totally vain. No ſooner did intelligence arrive

170 The cauſe of Boſton eſpouſed by all the reſt of the colonies.

of the remaining bills paſſed in the ſeſſion of 1774, than the cauſe of Boſton became the cauſe of all the colonies. The port-bill had already occaſioned violent commotions throughout them all. It had been reprobated in provincial meetings, and reſiſtance even to the laſt had been recommended againſt ſuch oppreſſion. In Virginia, the firſt of June, the day on which the port of Boſton was to be ſhut up, was held as a day of humiliation, and a public interceſſion in favour of America was enjoined. The ſtyle of the prayer enjoined at this time was, that "God would give the people one heart and one mind, firmly to oppoſe every invaſion of the American rights." The Virginians, however, did not content themſelves with acts of religion. They recommended in the ſtrongeſt manner a general congreſs of all the colonies, as fully perſuaded that an attempt to tax any colony in an arbitrary manner was in reality an attack upon them all, and muſt ultimately end in the ruin of them all.

The provinces of New York and Penſylvania, however, were leſs ſanguine than the reſt, being ſo cloſely connected in the way of trade with Great Britain, that the giving it up entirely appeared a matter of the moſt ſerious magnitude, and not to be thought of but after every other method had failed.

171 The Americans firmly united in their oppoſition to Britain.

The intelligence of the remaining bills reſpecting Boſton, however, ſpread a freſh alarm throughout the continent, and fixed thoſe who had ſeemed to be the moſt wavering. The propoſal of giving up all commercial intercourſe with Britain was again propoſed ; contributions for the inhabitants of Boſton were raiſed in every quarter ; and they every day received addreſſes commending them for the heroic courage with which they ſuſtained their calamity.

The Boſtonians on their part were not wanting in their endeavours to promote the general cauſe. An agreement was framed, which, in imitation of former

172 Solemn league and covenant formed at Boſton.

times, they called a Solemn League and Covenant. By this the ſubſcribers moſt religiouſly bound themſelves to break off all communication with Britain after the expiration of the month of Auguſt enſuing, until the obnoxious acts were repealed ; at the ſame time they engaged neither to purchaſe nor uſe any goods imported after that time, and to renounce all connection with thoſe who did, or who refuſed to ſubſcribe to this covenant ; threatening to publiſh the names of the refractory, which at this time was a puniſhment by no means to be deſpiſed. Agreements of a ſimilar kind were almoſt inſtantaneouſly entered into

173 The governor attempts in vain to counteract it by proclamation.

throughout all America. General Gage indeed attempted to counteract the covenant by a proclamation, wherein it was declared an illegal and traiterous combination, threatening with the pains of law ſuch as ſubſcribed or countenanced it. But matters were too far gone for his proclamations to have any effect. The Americans retorted the charge of illegality on his own proclamation, and inſiſted that the law allowed ſubjects to meet in order to conſider of their grievances, and aſſociate for relief from oppreſſion.

Preparations were now made for holding the general congreſs ſo often propoſed. Philadelphia, as being the moſt centrical and conſiderable town, was pitched upon for the place of its meeting. The delegates of whom it was to be compoſed were choſen by the repreſentatives of each province, and were in number from two to ſeven for each colony, though no province had more than one vote.

174 Congreſs meets at Philadelphia.

The firſt congreſs which met at Philadelphia, in the beginning of September 1774, conſiſted of 51 delegates. The novelty and importance of the meeting excited an univerſal attention ; and their tranſactions were ſuch as could not but tend to render them reſpectable.

175 Account of its tranſactions.

The firſt act of congreſs was an approbation of the conduct of Maſſachuſet's Bay, and an exhortation to continue in the ſame ſpirit with which they had begun. Supplies for the ſuffering inhabitants (whom indeed the operation of the port-bill had reduced to great diſtreſs) were ſtrongly recommended ; and it was declared, that in caſe of attempts to enforce the obnoxious acts by arms, all America ſhould join to aſſiſt the town of Boſton ; and ſhould the inhabitants be obliged, during the courſe of hoſtilities, to remove further up the country, the loſſes they might ſuſtain ſhould be repaired at the public expence.

They next addreſſed General Gage by letter ; in which, having ſtated the grievances of the people of Maſſachuſet's colony, they informed him of the fixed and unalterable determination of all the other provinces to ſupport their brethren and to oppoſe the Britiſh acts of parliament ; that they themſelves were appointed to watch over the liberties of America ; and intreated him to deſiſt from military operations, leſt ſuch hoſtilities might be brought on as would fruſtrate all hopes of reconciliation with the parent ſtate.

The next ſtep was to publiſh a declaration of their rights. Theſe they ſummed up in the rights belonging to Engliſhmen ; and particularly inſiſted, that as their diſtance rendered it impoſſible for them to be repreſented in the Britiſh parliament, their provincial aſſemblies, with the governor appointed by the king, conſtituted the only legiſlative power within each province. They would, however, conſent to ſuch acts of parliament as were evidently calculated merely for the regulation of commerce, and ſecuring to the parent ſtate the benefits of the American trade ; but would never allow that they could impoſe any tax on the colonies, for the purpoſe of raiſing a revenue, without their conſent. They proceeded to reprobate the intention of each of the new acts of parliament ; and inſiſted on all the rights they had enumerated as being unalienable, and what none could deprive them of. The Canada act they particularly pointed out as being extremely inimical to the colonies, by whoſe aſſiſtance it had been conquered ; and they termed it "An act for eſtabliſhing the Roman Catholic religion in Canada, aboliſhing the equitable ſyſtem of Engliſh laws, and eſtabliſhing a tyranny there." They further declared in favour of a non-importation and non-conſumption of Britiſh goods until the acts were repealed by which duties were impoſed upon tea, coffee, wine, ſugar, and molaſſes, imported into America, as well as the Boſton port-act, and the three others paſſed in the preceding ſeſſion of parliament. The new regulations againſt the importation and conſumption of Britiſh commodities were then drawn up with great ſolemnity ; and they concluded with returning the warm-

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America. est thanks to those members of parliament who had with so much zeal, though without any success, opposed the obnoxious acts of parliament.

Their next proceedings were to frame a petition to the king, an address to the British nation, and another to the colonies; all of which were so much in the usual strain of American language for some time past, that it is needless to enter into any particular account of them. It is sufficient to say that they were all drawn up in a masterly manner, and ought to have impressed the people of this country with a more favourable idea of the Americans than they could at that time be induced to entertain.

All this time the disposition of the people had corresponded with the warmest wishes of congress. The first of June had been kept as a fast, not only throughout Virginia where it was first proposed, but through the whole continent. Contributions for the distresses of Boston had been raised throughout America, and people of all ranks seemed to be particularly touched with them. Even those who seemed to be most likely to derive advantages from them took no opportunity, as has been already instanced in the case of Salem.

176 Generosity of the inhabitants of Marblehead to Boston.

The inhabitants of Marblehead also showed a noble example of magnanimity in the present case. Though situated in the neighbourhood of Boston, and most likely to derive benefit from their distresses, they did not attempt to take any advantage, but generously offered the use of their harbour to the Bostonians, as well as their wharfs and warehouses, free of all expence. In the mean time the British forces at Boston were continually increasing in number, which greatly augmented the general jealousy and disaffection; the country were ready to rise at a moment's warning;

177 Extreme attachment of the country people to the Bostonians.

and the experiment was made by giving a false alarm that the communication between the town and country was to be cut off, in order to reduce the former by famine to a compliance with the acts of parliament. On this intelligence the country people assembled in great numbers, and could not be fatisfied till they had sent messengers into the city to inquire into the truth of the report. These messengers were enjoined to inform the town's people, that if they should be so pusillanimous as to make a surrender of their liberties, the province would not think itself bound by such examples; and that Britain, by breaking their original charter, had annulled the contract subsisting between them, and left them to act as they thought proper.

The people in every other respect manifested their inflexible determination to adhere to the plan they had so long followed. The new counsellors and judges were obliged to resign their offices, in order to preserve their lives and properties from the fury of the multitude. In some places they shut up the avenues to the court-houses; and when required to make way for the judges, replied, that they knew of none but such as were appointed by the ancient usage and custom of the province. Every where they manifested the most ardent desire of learning the art of war; and every individual who could bear arms, was most assiduous in procuring them, and learning their exercise.

178 Gen. Gage fortifies Boston Neck,

Matters at last proceeded to such an height, that General Gage thought proper to fortify the neck of land which joins the town of Boston to the continent. This, though undoubtedly a prudent measure in his situation, was exclaimed against by the Americans in the most vehement manner; but the General, instead of giving ear to their remonstrances, deprived them of all power of acting against himself, by seizing the provincial powder, ammunition, and military stores at Cambridge and Charlestown.

179 And seizes the military stores belonging to the province.

This excited such indignation, that it was with the utmost difficulty the people could be restrained from marching to Boston and attacking the troops. Even in the town itself, the company of cadets that used to attend him disbanded themselves, and returned the standard he had as usual presented them with on his accession to the government. This was occasioned by his having deprived the celebrated John Hancock, afterwards president of the congress, of his commission as colonel of the cadets. A similar instance happened of a provincial colonel having accepted a seat in the new council; upon which 24 officers of his regiment resigned their commissions in one day.

180 Opposition to the British parliament still increases.

In the mean time a meeting was held of the principal inhabitants of the towns adjacent to Boston. The purport of this was publicly to renounce all obedience to the late acts of parliament, and to form an engagement to indemnify such as should be prosecuted on that account; the members of the new council were declared violators of the rights of their country; all ranks and degrees were exhorted to learn the use of arms; and the receivers of the public revenue were ordered not to deliver it into the treasury, but retain it in their own hands till the constitution should be restored, or a provincial congress dispose of it otherwise.

A remonstrance against the fortifications on Boston Neck was next prepared; in which, however, they still pretended their unwillingness to proceed to any hostile measures; asserting only as usual their firm determination not to submit to the acts of parliament they had already so much complained of.

181 A general assembly called and dissolved by proclamation.

The governor, to restore tranquillity, if possible, called a general assembly; but so many of the council had resigned their seats, that he was induced to countermand its sitting by proclamation. This measure, however, was deemed illegal; the assembly met at Salem; and after waiting a day for the governor, voted themselves into a provincial congress, of which Mr Hancock was chosen president. A committee was instantly appointed, who waited on the governor with a remonstrance concerning the fortifications on Boston Neck; but nothing of consequence took place, both parties mutually criminating each other. The winter was now coming on, and the governor, to avoid quartering the soldiers upon the inhabitants, proposed to erect baracks for them;

182 Gen. Gage meets with great difficulties in accommodating his troops.

but the select men of Boston compelled the workmen to desist. Carpenters were sent for to New York, but they were refused; and it was with the utmost difficulty that he could procure winter-lodgings for his troops. Nor was the difficulty less in procuring clothes; as the merchants of New York told him, that "they would never supply any article for the benefit of men sent as enemies to their country."

183 The Americans make preparations for war.

This disposition, known to be almost universal throughout the continent, was in the highest degree satisfactory to congress. Every one saw that the ensuing spring was to be the season of commencing hostilities, and the most indefatigable diligence was used by the colonies to be well provided against such a formidable

America. midable enemy. A lift of all the fencible men in each colony was made out, and efpecially of thofe who had ferved in the former war; of whom they had the fatisfaction to find that two-thirds were ftill alive and fit to bear arms. Magazines of arms were collected, and money was provided for the payment of troops. The governors in vain attempted to put a ftop to thefe proceedings by proclamations; the fatal period was now arrived; and the more the fervants of government attempted to reprefs the fpirit of the Americans, the more violent it appeared.

184
Diftrefs of the inhabitants of Bofton.

In the mean time the inhabitants of Bofton were reduced to great diftrefs. The Britifh troops, now diftinguifhed by the name of the *enemy*, were abfolutely in poffeffion of it; the inhabitants were kept as prifoners, and might be made accountable for the conduct of the whole colonies; and various meafures were contrived to relieve the latter from fuch a difagreeable fituation. Sometimes it was thought expedient to remove the inhabitants altogether; but this was impracticable without the governor's confent. It was then propofed to fet fire to the town at once, after valuing the houfes and indemnifying the proprietors; but this being found equally impracticable, it was refolved to wait fome other opportunity, as the garrifon were not very numerous, and, not being fupplied with neceffaries by the inhabitants, might foon be obliged to leave the place. The friends of Britifh government indeed attempted to do fomething in oppofition to the general voice of the people; but after a few ineffectual meetings and refolutions, they were utterly filenced, and obliged to yield to the fuperior number of their adverfaries.

Matters had now proceeded fo far that every idea of reconciliation or friendfhip with Britain was loft. The Americans therefore, without ceremony, began to feize on the military ftores and ammunition belonging to government.

185
Military ftores feized by the Americans.

This firft commenced at New-port in Rhode Ifland, where the inhabitants carried off 40 pieces of cannon appointed for the protection of the place; and on being afked the reafon of this proceeding, they replied, that the people had feized them left they fhould be made ufe of againft themfelves. After this the affembly met, and refolved that ammunition and warlike ftores fhould be purchafed with the public money.

New-Hampfhire followed the example of Rhode-Ifland, and feized a fmall fort for the fake of the powder and military ftores it contained. In Penfylvania, however, a convention was held, which expreffed an earneft defire of reconciliation with the mother-country; though, at the fame time, in the ftrongeft manner declaring, that they were refolved to take up arms in defence of their juft rights, and defend to the laft their oppofition to the late acts of parliament; and the people were exhorted to apply themfelves with the greateft affiduity to the profecution of fuch manufactures as were neceffary for their defence and fubfiftence, fuch as falt, falt-petre, gunpowder, fteel, &c. This was the univerfal voice of the colonies, New-York only excepted. The affembly of that province, as yet ignorant of the fate of their laft remonftrance, refufed to concur with the other colonies in their determination to throw off the Britifh yoke: their attachment, however, was very faint, and by the event it appeared that a perfeverance in the meafures which the miniftry had adopted was fufficient to unite them to the reft. America.

As the difturbances had originated in the province of Maffachufet's Bay, and there continued all along with the greateft violence, fo this was the province where the firft hoftilities were formally commenced.

186
Maffachufet's affembly recommend preparations for war.

In the beginning of February the provincial congrefs met at Cambridge; and as no friends to Britain could now find admittance to that affembly, the only confideration was how to make proper preparations for war. Expertnefs in military difcipline was recommended in the ftrongeft manner, and feveral military inftitutions enacted; among which that of the *minute-men* was one of the moft remarkable. Thefe were chofen from the moft active and expert among the militia; and their bufinefs was to keep themfelves in conftant readinefs at the call of their officers; from which perpetual vigilance they derived their title.—It was now eafily feen that a flight occafion would bring on hoftilities, which could not but be attended with the moft violent and certain deftruction to the vanquifhed party; for both were fo much exafperated by a long courfe of reproaches and literary warfare, that they feemed to be filled with the utmoft inveteracy againft each other.

On the 26th of February General Gage having been informed that a number of field-pieces had been brought to Salem, difpatched a party to feize them. Their road was obftructed by a river, over which was a draw-bridge. This the people had pulled up, and refufed to let down: upon which the foldiers feized a boat to ferry them over; but the people cut out her bottom. Hoftilities would immediately have commenced, had it not been for the interpofition of a clergyman, who reprefented to the military on the one hand, the folly of oppofing fuch numbers; and to the people on the other, that as the day was far fpent the military could not execute their defign, fo that they might without any fear leave them the quiet poffeffion of the draw-bridge. This was complied with; and the foldiers, after having remained for fome time at the bridge, returned without executing their orders.

187
Skirmifh at Lexington.

The next attempt, however, was attended with more ferious confequences. General Gage, having been informed that a large quantity of ammunition and military ftores had been collected at Concord, about 20 miles from Bofton, and where the provincial congrefs was fitting, fent a detachment, under the command of Colonel Smith and Major Pitcairn, to deftroy the ftores, and, as was reported, to feize Meffrs Hancock and Adams, the leading men of the congrefs. They fet out before day-break, on the 19th of April, marching with the utmoft filence, and fecuring every one they met on the road, that they might not be difcovered. But notwithftanding all their care, the continual ringing of bells and firing of guns as they went along, foon gave them notice that the country was alarmed. About five in the morning they had reached Lexington, 15 miles from Bofton, where the militia of the place were exercifing. An officer called out to them to difperfe; but fome fhots, it is faid, being at that moment fired from a houfe in the neighbourhood, the military made a difcharge, which killed and wounded feveral of the militia. The detachment then proceeded to Concord, where, having deftroyed the ftores, they were encountered by the Americans; and a fcuffle enfued,

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in which several fell on both sides. The purpose of their expedition being thus accomplished, it was necessary for the king's troops to retreat, which they did through a continual fire kept upon them from Concord to Lexington. Here their ammunition was totally expended; and they would have been unavoidably cut off, had not a considerable reinforcement commanded by Lord Percy luckily met them. The Americans, however, continued their attack with great fury; and the British would still have been in the utmost danger, had it not been for two field-pieces which Lord Percy had brought with him. By these the impetuosity of the Americans was checked, and the British made good their retreat to Boston with the loss of 250 killed and wounded: that of the Americans was about 60.

188 great army assembles before Boston.

By this engagement the spirits of the Americans were so raised, that they meditated nothing less than the total expulsion of the British troops from Boston. An army of 20,000 men was assembled, who formed a line of encampment from Roxbury to Mystic, through a space of about 30 miles; and here they were soon after joined by a large body of Connecticut troops, under General Putnam, an old officer of great bravery and experience. By this formidable force was the town of Boston now kept blocked up. General Gage, however, had so strongly fortified it, that the enemy, powerful as they were, durst not make an attack; while on the other hand, his force was by far too insignificant to meet such an enemy in the field. But towards the end of May, a considerable reinforcement having arrived, with Generals Howe, Burgoyne, and Clinton, he was soon enabled to attempt something of consequence; and this the boasts of the provincials, that they were besieging those who had been sent to subdue them, seemed to render necessary. Some skirmishes in the mean time happened in the islands lying off Boston harbour, in which the Americans had the advantage, and burnt an armed schooner, which her people had been obliged to abandon after she was left aground by the tide. Nothing decisive, however, took place till the 17th of June. In the neighbourhood of Charlestown, a place on the northern shore of the peninsula on which Boston stands, is an high ground called *Bunker's Hill*, which overlooks and commands the whole town of Boston. In the night of the 16th the provincials took possession of this place; and worked with such indefatigable diligence, that, to the astonishment of their enemies, they had before day-light almost completed a redoubt, with a strong entrenchment reaching half a mile eastward, as far as the river Mystic. After this they were obliged to sustain a heavy and incessant fire from the ships and floating batteries with which Charlestown Neck was surrounded, as well as the cannon that could reach the place from Boston; in spite of which, however, they continued their work and finished it before mid-day. A considerable body of foot was then landed at the foot of Bunker's Hill, under the command of Generals Howe and Pigot; the former being appointed to attack the lines, and the latter the redoubt. The Americans, however, having the advantage of the ground, as well as of their intrenchments, poured down such incessant volleys as threatened the whole body with destruction; and General Howe was for a little time left almost alone, all his officers being killed or wounded. The provincials in the mean time had taken possession of Charlestown, so that General Pigot was obliged to contend with them in that place as well as in the redoubt. The consequence was, that he was overmatched; his troops were thrown into disorder; and he would in all probability have been defeated, had not General Clinton advanced to his relief: upon which the attack was renewed with such fury, that the provincials were driven beyond the neck that leads to Charlestown. In the heat of the engagement the British troops were obliged to set fire to the town of Charlestown, which quickly obliged the provincials to yield after they were deprived of that shelter. The loss on the British side amounted to about 1000, among whom were 19 officers killed and 70 wounded; that of the Americans did not exceed 500.

189 Battle at Bunker's Hill.

The British troops claimed the victory in this engagement with justice, though it must be allowed that it was dearly bought; and the Americans boasted that the real advantages were on their side, as they had so much weakened the enemy that they durst not afterwards venture out of their entrenchments. From the many advantages, however, which the Americans possessed, it is evident that the greatest display of valour was on the side of their enemies. The former were strongly entrenched, and most of their fortifications cannon proof; their soldiers were all chosen, and excellent marksmen, to whom muskets ready loaded were handed as fast as they were discharged; and when one party was wearied, another came to their assistance, as was perceived by the spectators on the tops of the houses at Boston. Considering, however, that this was the first time the provincials had been in actual service, it must be owned that they behaved with great spirit, and by no means merited the appellation of *cowards*, with which they were so often branded in Britain.

190 The Americans become more and more determined in their opposition.

In other places the same determined spirit of resistance appeared on the part of the Americans. Lord North's conciliatory scheme was utterly rejected by the assemblies of Pensylvania and New Jersey, and afterwards in every other colony. The commencement of hostilities at Lexington determined the colony of New-York, which had hitherto continued to waver, to unite with the rest; and as the situation of New-York renders it unable to resist an attack from the sea, it was resolved, before the arrival of a British fleet, to secure the military stores, send off the women and children, and to set fire to the city if it was still found incapable of defence. The exportation of provisions was every where prohibited, particularly to the British fishery on the banks of Newfoundland, or to such colonies of America as should adhere to the British interest. Congress resolved on the establishment of an army, and of a large paper-currency in order to support it. In the inland northern colonies, Colonels Easton and Ethan Allen, without receiving any orders from Congress, or communicating their design to any body, with a party of only 250 men, surprised the forts of Crown Point, Ticonderago, and the rest that form a communication betwixt the colonies and Canada. On this occasion 200 pieces of cannon fell into their hands, besides mortars and a large quantity of military stores, together with two armed vessels, and materials for the construction of others.

191 Crown Point and Ticonderago taken by the Americans.

After

America.

After the battle of Bunker's Hill, the provincials erected fortifications on the heights which commanded Charlestown, and strengthened the rest in such a manner that there was no hope of driving them from thence; at the same time that their activity and boldness astonished the British officers, who had been accustomed to entertain too mean an opinion of their courage.

192 Troops in Boston distressed.

The troops, thus shut up in Boston, were soon reduced to distress. Their necessities obliged them to attempt the carrying off the American cattle on the islands before Boston, which produced frequent skirmishes; but the provincials, better acquainted with the navigation of these shores, landed on the islands, destroyed or carried off whatever was of any use, burned the light-house at the entrance of the harbour, and took prisoners the workmen sent to repair it, as well as a party of marines who guarded them. Thus the garrison were reduced to the necessity of sending out armed vessels to make prizes indiscriminately of all that came in their way, and of landing in different places to plunder for subsistence as well as they could.

193 Articles of union betwixt the colonies.

The congress in the mean time continued to act with all the vigour which its constituents had expected. Articles of confederation and perpetual union were drawn up and solemnly agreed upon; by which they bound themselves and their posterity for ever. These were in substance as follows:

1. Each colony was to be independent within itself, and to retain an absolute sovereignty in all domestic affairs.

2. Delegates to be annually elected to meet in congress, at such time and place as should be enacted in the preceding congress.

3. This assembly should have the power of determining war or peace, making alliances; and in short all that power which sovereigns of states usually claim as their own.

4. The expences of war to be paid out of the common treasury, and raised by a poll-tax on males between 16 and 60; the proportions to be determined by the laws of the colony.

5. An executive council to be appointed to act in place of the congress during its recess.

6. No colony to make war with the Indians without consent of congress.

7. The boundaries of all the Indian lands to be secured and ascertained to them; and no purchases of lands were to be made by individuals, or even by a colony, without consent of congress.

8. Agents appointed by congress should reside among the Indians, to prevent frauds in trading with them, and to relieve, at the public expence, their wants and distresses.

9. This confederation to last until there should be a reconciliation with Britain; or, if that event should not take place, it was to be perpetual.

194 Declaration on taking up arms.

After the action of Bunker's Hill, however, when the power of Great Britain appeared less formidable in the eyes of America than before, congress proceeded formally to justify their proceedings in a declaration drawn up in terms more expressive, and well calculated to excite attention.

"Were it possible (said they) for men who exercise their reason, to believe that the divine Author of our existence intended a part of the human race to hold an absolute property in and unbounded power over others, marked out by His infinite goodness and wisdom as the objects of a legal domination, never rightfully resistible, however severe and oppressive; the inhabitants of these colonies might at least require from the parliament of Great Britain some evidence that this dreadful authority over them had been granted to that body: but a reverence for our Great Creator, principles of humanity, and the dictates of common sense, must convince all those who reflect upon the subject, that government was instituted to promote the welfare of mankind, and ought to be administered for the attainment of that end.

"The legislature of Great Britain, however, stimulated by an inordinate passion for power, not only unjustifiable, but which they know to be peculiarly reprobated by the very constitution of that kingdom; and despairing of success in any mode of contest where regard should be had to law, truth, or right; have at length, deserting those, attempted to effect their cruel and impolitic purpose of enslaving these colonies by violence, and have thereby rendered it necessary for us to close with their last appeal from reason to arms. Yet, however blinded that assembly may be, by their intemperate rage for unlimited domination, so to slight justice in the opinion of mankind, we esteem ourselves bound by obligations to the rest of the world to make known the justice of our cause."

After taking notice of the manner in which their ancestors left Britain, the happiness attending the mutual friendly commerce betwixt that country and her colonies, and the remarkable success of the late war, they proceed as follows: "The new ministry finding the brave foes of Britain, though frequently defeated, yet still contending, took up the unfortunate idea of granting them a hasty peace, and of then subduing her faithful friends.

"These devoted colonies were judged to be in such a state as to present victories without bloodshed, and all the easy emoluments of statutable plunder. The uninterrupted tenor of their peaceable and respectful behaviour from the beginning of their colonization; their dutiful, zealous, and useful services during the war, though so recently and amply acknowledged in the most honourable manner by his Majesty, by the late king, and by parliament, could not save them from the intended innovations. Parliament was influenced to adopt the pernicious project; and assuming a new power over them, has in the course of eleven years given such decisive specimens of the spirit and consequences attending this power, as to leave no doubt of the effects of acquiescence under it.

"They have undertaken to give and grant our money without our consent, though we have ever exercised an exclusive right to dispose of our own property. Statutes have been passed for extending the jurisdiction of the courts of admiralty and vice-admiralty beyond their ancient limits; for depriving us of the accustomed and inestimable rights of trial by jury, in cases affecting both life and property; for suspending the legislature of one of our colonies; for interdicting all commerce to the capital of another; and for altering fundamentally the form of government established by charter, and secured by acts of its own legislature; and

America.

and ſolemnly confirmed by the crown; for exempting the murderers of coloniſts from legal trial, and in effect from puniſhment; for erecting in a neighbouring province, acquired by the joint arms of Great Britain and America, a deſpotiſm dangerous to our very exiſtence; and for quartering ſoldiers upon the coloniſts in time of a profound peace. It has alſo been reſolved in parliament, that coloniſts charged with committing certain offences, ſhall be tranſported to England to be tried.

"But why ſhould we enumerate our injuries in detail?—By one ſtatute it was declared, that parliament can of right make laws to bind us in all caſes whatever. What is to defend us againſt ſo enormous, ſo unlimited a power? Not a ſingle perſon who aſſumes it is choſen by us, or is ſubject to our control or influence; but on the contrary, they are all of them exempt from the operation of ſuch laws; and an American revenue, if not diverted from the oſtenſible purpoſes from which it is raiſed, would actually lighten their own burdens in proportion as it increaſes ours.

"We ſaw the miſery to which ſuch deſpotiſm would reduce us. We for ten years inceſſantly and ineffectually beſieged the throne as ſupplicants; we reaſoned, we remonſtrated with parliament in the moſt mild and decent language; but adminiſtration, ſenſible that we ſhould regard theſe meaſures as freemen ought to do, ſent over fleets and armies to enforce them.

"We have purſued every temperate, every reſpectful meaſure; we have even proceeded to break off all commercial intercourſe with our fellow-ſubjects as our laſt peaceable admonition, that our attachment to no nation on earth would ſupplant our attachment to liberty: this we flattered ourſelves was the ultimate ſtep of the controverſy; but ſubſequent events have ſhown how vain was this hope of finding moderation in our enemies!

"The Lords and Commons, in their addreſs in the month of February, ſaid, that a rebellion at that time actually exiſted in the province of Maſſachuſet's Bay; and that thoſe concerned in it had been countenanced and encouraged by unlawful combinations and engagements entered into by his Majeſty's ſubjects in ſeveral of the colonies; and therefore they beſought his Majeſty that he would take the moſt effectual meaſures to enforce due obedience to the laws and authority of the ſupreme legiſlature. Soon after the commercial intercourſe of whole colonies with foreign countries was cut off by an act of parliament; by another, ſeveral of them were entirely prohibited from the fiſheries in the ſeas near their coaſts, on which they always depended for their ſubſiſtence; and large reinforcements of ſhips and troops were immediately ſent over to General Gage.

"Fruitleſs were all the intreaties, arguments, and eloquence of an illuſtrious band of the moſt diſtinguiſhed peers and commoners, who nobly and ſtrenuouſly aſſerted the juſtice of our cauſe, to ſtay, or even to mitigate, the heedleſs fury with which theſe accumulated outrages were hurried on. Equally fruitleſs was the interference of the city of London, of Briſtol, and many other reſpectable towns in our favour."

After having reproached parliament, General Gage, and the Britiſh government in general, they proceed thus: "We are reduced to the alternative of chooſing an unconditional ſubmiſſion to tyranny or reſiſtance by force. The latter is our choice. We have counted the coſt of this conteſt, and find nothing ſo dreadful as voluntary ſlavery. Honour, juſtice, and humanity, forbid us tamely to ſurrender that freedom which we received from our gallant anceſtors, and which our innocent poſterity have a right to receive from us. Our cauſe is juſt; our union is perfect; our internal reſources are great; and, if neceſſary, foreign aſſiſtance is undoubtedly attainable. We fight not for glory or conqueſt; we exhibit to mankind the remarkable ſpectacle of a people attacked by unprovoked enemies. They boaſt of their privileges and civilization, and yet proffer no milder conditions than ſervitude or death. In our own native land, in defence of the freedom that is our birthright, for the protection of our property acquired by the honeſt induſtry of our forefathers and our own, againſt violence actually offered, we have taken up arms; we ſhall lay them down when hoſtilities ſhall ceaſe on the part of our aggreſſors, and all danger of their being renewed ſhall be removed,—and not before."

Theſe are ſome of the moſt ſtriking paſſages in the declaration of congreſs on taking up arms againſt Great Britain, and dated July 6th 1775. Without inquiring whether the principles on which it is founded are right or wrong, the determined ſpirit which it ſhows, ought to have convinced us, that the conqueſt of America was an event ſcarce ever to be expected. In every other reſpect an equal ſpirit was ſhown; and the rulers of the Britiſh nation had the mortification to ſee thoſe whom they ſtyled *rebels* and *traitors*, ſucceed in negociations in which they themſelves were utterly 195
foiled. In the paſſing of the Quebec-bill, miniſtry had flattered themſelves that the Canadians would be ſo much attached to them on account of reſtoring the French laws, that they would very readily join in any attempt againſt the coloniſts who had reprobated that bill in ſuch ſtrong terms: but in this, as in every thing elſe indeed, they found themſelves miſtaken. The Canadians having been ſubject to Britain for a period of 15 years, and being thus rendered ſenſible of the ſuperior advantages of Britiſh government, received the bill itſelf with evident marks of diſapprobation; nay, reprobated it as tyrannical and oppreſſive. A ſcheme had been formed for General Carleton, governor of the province, to raiſe an army of Canadians wherewith to act againſt the Americans; and ſo ſanguine were the hopes of adminiſtration in this reſpect, that they had ſent 20,000 ſtand of arms, and a great quantity of military ſtores, to Quebec for the purpoſe. But the people, though they did not join the Americans, yet were found immoveable in their purpoſe to ſtand neuter. Application was made to the biſhop; but he declined to interpoſe his influence, as contrary to the rules of the Popiſh clergy: ſo that the utmoſt efforts of government in this province were found to anſwer little or no purpoſe.

Quebec bill diſagreeable to thoſe whom it was intended to pleaſe.

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The Britiſh adminiſtration next tried to engage the Indians in their cauſe. But though agents were diſperſed among them with large preſents to the chiefs, they univerſally replied, that they did not underſtand the nature of the quarrel, nor could they diſtinguiſh whether thoſe who dwelt in America or on the other ſide of the ocean were in fault: but they were ſurpriſed to ſee Engliſhmen aſk their aſſiſtance againſt

Miniſtry attempt in vain to arm the Indians.

America. againſt one another; and adviſed them to be reconciled, and not think of ſhedding the blood of their brethren. —To the repreſentations of congreſs they paid more reſpect. Theſe ſet forth, that the Engliſh on the other ſide of the ocean had taken up arms to enſlave not only their countrymen in America, but the Indians alſo; and if the latter ſhould enable them to overcome the coloniſts, they themſelves would ſoon be reduced to a ſtate of ſlavery alſo. By arguments of this kind theſe ſavages were engaged to remain neuter; and thus the coloniſts were freed from a moſt dangerous enemy. On this occaſion the congreſs thought proper to hold a ſolemn conference with the different tribes of Indians. The ſpeech made by them on the occaſion is curious, but too long to be fully inſerted. The following is a ſpecimen of the European mode of addreſſing theſe people.

197 Speech of the commiſſioners from congreſs to the Indians.

"Brothers, Sachems, and Warriors!

"We, the delegates from the Twelve United Provinces, now ſitting in general congreſs at Philadelphia, ſend their talk to you our brothers.

"Brothers and Friends, now attend!

"When our fathers croſſed the great water, and came over to this land, the king of England gave them a talk, aſſuring them that they and their children ſhould be his children; and that if they would leave their native country, and make ſettlements, and live here, and buy and ſell, and trade with their brethren beyond the water, they ſhould ſtill keep hold of the ſame covenant-chain, and enjoy peace; and it was covenanted, that the fields, houſes, goods, and poſſeſſions, which our fathers ſhould acquire, ſhould remain to them as their own, and be their childrens for ever, and at their ſole diſpoſal.

"Brothers and Friends, open a kind ear!

"We will now tell you of the quarrel betwixt the counſellors of King George and the inhabitants and colonies of America.

"Many of his counſellors have perſuaded him to break the covenant-chain, and not to ſend us any more good talks. They have prevailed upon him to enter into a covenant againſt us; and have torn aſunder, and caſt behind their backs, the good old covenant which their anceſtors and ours entered into, and took ſtrong hold of. They now tell us they will put their hands into our pocket without aſking, as though it were their own; and at their pleaſure they will take from us our charters, or written civil conſtitution, which we love as our lives; alſo our plantations, our houſes, and goods, whenever they pleaſe, without aſking our leave. They tell us, that our veſſels may go to that or this iſland in the ſea, but to this or that particular iſland we ſhall not trade any more; and in caſe of our noncompliance with theſe new orders, they ſhut up our harbours.

"Brothers, we live on the ſame ground with you; the ſame iſland is our common birth-place. We deſire to ſit down under the ſame tree of peace with you: let us water its roots, and cheriſh the growth, till the large leaves and flouriſhing branches ſhall extend to the ſetting ſun, and reach the ſkies. If any thing diſagreeable ſhould ever fall out between us, the Twelve United Colonies, and you, the Six Nations, to wound our peace, let us immediately ſeek meaſures for healing the breach. From the preſent ſituation of our affairs, we judge it expedient to kindle up a ſmall fire at Albany, where we may hear each other's voice, and diſcloſe our minds fully to one another." America.

The other remarkable tranſactions of this congreſs were the ultimate refuſal of the conciliatory propoſal made by Lord North, of which ſuch ſanguine expectations had been formed by the Engliſh miniſtry; and appointing a generaliſſimo to command their armies, which were now very numerous. The perſon choſen for this purpoſe was George Waſhington: a man ſo univerſally beloved, that he was raiſed to ſuch an high ſtation by the unanimous voice of congreſs; and his ſubſequent conduct ſhowed him every way worthy of it. Horace Gates and Charles Lee, two Engliſh officers of conſiderable reputation, were alſo choſen; the former an adjutant-general, the ſecond a major-general. Artemus Ward, Philip Schuyler, and Iſrael Putnam, were likewiſe nominated major-generals. Seth Pomeroy, Richard Montgomery, David Wooſter, William Heath, Joſeph Spencer, John Thomas, John Sullivan, and Nathaniel Green, were choſen brigadier-generals at the ſame time. 198 Gen. Waſhington appointed commander in chief.

Congreſs had now alſo the ſatisfaction to receive deputies from the colony of Georgia, expreſſing a deſire to join the confederacy. The reaſons they gave for renouncing their allegiance to Britain was, that the conduct of parliament towards the other colonies had been oppreſſive; that though the obnoxious acts had not been extended to them, they could view this only as an omiſſion, becauſe of the ſeeming little conſequence of their colony; and therefore looked upon it rather to be a ſlight than a favour. At the ſame time they framed a petition to the King, ſimilar to that ſent by the other colonies, and which met with a ſimilar reception. 199 Georgia accedes to the confederacy.

The ſucceſs which had hitherto attended the Americans in all their meaſures, now emboldened them to think not only of defending themſelves, but likewiſe of acting offenſively againſt Great Britain. The conqueſt of Canada appeared an object within their reach, and one that would be attended with many advantages; and as an invaſion of that province was already facilitated by the taking of Crown Point and Ticonderoga, it was reſolved if poſſible to penetrate that way into Canada, and reduce Quebec during the winter, before the fleets and armies which they were well aſſured would ſail thither from Britain ſhould arrive. By order of congreſs, therefore, 3000 men were put under the command of Generals Montgomery and Schuyler, with orders to proceed to Lake Champlain, from whence they were to be conveyed in flat-bottomed boats to the mouth of the river Sorel, a branch of the great river St Lawrence, and on which is ſituated a fort of the ſame name with the river. On the other hand, they were oppoſed by General Carleton governor of Canada, a man of great activity and experience in war; who, with a very few troops, had hitherto been able to keep in awe the diſaffected people of Canada, notwithſtanding all the repreſentations of the coloniſts. He had now augmented his army by a conſiderable number of Indians, and promiſed even in his preſent ſituation to make a very formidable reſiſtance. 200 The Americans attempt the conqueſt of Canada.

As ſoon as General Montgomery arrived at Crown Point,

America. Point, he received information that several armed vessels were stationed at St John's, a strong fort on the Sorel, with a view to prevent his crossing the lake; on which he took possession of an island which commands the mouth of the Sorel, and by which he could prevent them from entering the lake. In conjunction with General Schuyler, he next proceeded to St John's: but finding that place too strong, he landed on a part of the country considerably distant, and full of woods and swamps. From thence, however, they were driven by a party of Indians whom General Carleton had employed.

The provincial army was now obliged to retreat to the island of which they had at first taken possession; where General Schuyler being taken ill, Montgomery was left to command alone. His first step was to gain over the Indians whom Gen. Carleton had employed, and this he in a great measure accomplished; after which, on receiving the full number of troops appointed for his expedition, he determined to lay siege to St John's. In this he was facilitated by the reduction of Chamblee, a small fort in the neighbourhood, where he found a large supply of powder. An attempt was made by General Carleton to relieve the place; for which purpose he with great pains collected about 1000 Canadians, while Colonel Maclean proposed to raise a regiment of the Highlanders who had emigrated from their own country to America.

201 Chamblee taken.

202 Gen. Carleton defeated.

But while Gen. Carleton was on his march with these new levies, he was attacked by a superior force of provincials, and utterly defeated; which being made known to another body of Canadians who had joined Colonel Maclean, they abandoned him without striking a blow, and he was obliged to retreat to Quebec.

The defeat of General Carleton was a sufficient recompence to the Americans for that of Colonel Ethan Allen, which had happened some time before. The success which had attended this gentleman against Crown Point and Ticonderago had emboldened him to make a similar attempt on Montreal; but being attacked by the militia of the place, supported by a detachment of regulars, he was entirely defeated and taken prisoner.

As the defeat of General Carleton and the desertion of Maclean's forces left no room for the garrison of St John's to hope for any relief, they now consented to surrender themselves prisoners of war; but were in other respects treated with great humanity. They were in number 500 regulars and 200 Canadians, among whom were many of the French nobility, who had been very active in promoting the cause of Britain among their countrymen.

203 St John's fort taken,

General Montgomery next took measures to prevent the British shipping from passing down the river from Montreal to Quebec. This he accomplished so effectually, that the whole were taken. The town itself was obliged to surrender at discretion; and it was with the utmost difficulty that General Carleton escaped in an open boat by the favour of a dark night.

204 And likewise Montreal.

No further obstacle now remained in the way of the Americans to the capital, except what arose from the nature of the country; and these indeed were very considerable. Nothing, however, could damp the ardour of the provincials. Notwithstanding it was now the middle of November, and the depth of winter was at hand, Colonel Arnold formed a design of penetrating through woods, morasses, and the most frightful solitudes from New England to Canada by a nearer way than that which Montgomery had chosen; and this he accomplished in spite of every difficulty, to the astonishment of all who saw or heard of the attempt. This desperate march, however, cannot be looked upon as conducive to any good purpose. A third part of his men under another colonel had abandoned him by the way, under pretence of want of provisions; the total want of artillery rendered his presence insignificant before a place strongly fortified; and the smallness of his army rendered it even doubtful whether he could have taken the town by surprise. The Canadians indeed were amazed at the exploit, and their inclination to revolt from Britain was somewhat augmented; but none of them as yet took up arms in behalf of America. The consternation into which the town of Quebec was thrown proved detrimental rather than otherwise to the expedition; as it doubled the vigilance and activity of the inhabitants to prevent any surprise; and the appearance of common danger united all parties, who, before the arrival of Arnold, were contending most violently with one another. He was therefore obliged to content himself with blocking up the avenues to the town, in order to distress the garrison for want of provisions; and even this he was unable to do effectually, by reason of the small number of his men.

205 Col. Arnold penetrates into Canada.

The matter was not much mended by the arrival of General Montgomery. The force he had with him, even when united to that of Arnold, was too insignificant to attempt the reduction of a place so strongly fortified, especially with the assistance only of a few mortars and field-pieces. After the siege had continued through the month of December, General Montgomery, conscious that he could accomplish his end no other way than by surprise, resolved to make an attempt on the last day of the year 1775. The method he took at this time was perhaps the best that human wisdom could devise. He advanced by break of day, in the midst of an heavy fall of snow, which covered his men from the sight of the enemy. Two real attacks were made by himself and Colonel Arnold, at the same time that two feigned attacks were made on two other places, thus to distract the garrison, and make them divide their forces. One of the real attacks was made by the people of New York, and the other by those of New England under Arnold. Their hopes of surprising the place, however, were defeated by the signal for the attack being through some mistake given too soon. General Montgomery himself had the most dangerous place, being obliged to pass between the river and some high rocks on which the Upper Town stands; so that he was forced to make what haste he could to close with the enemy. His fate, however, was now decided. Having forced the first barrier, a violent discharge of musketry and grape-shot from the second killed him, his principal officers, and the most of the party he commanded; on which those who remained immediately retreated. Colonel Arnold in the mean time made a desperate attack on the Lower Town, and carried one of the barriers after an obstinate resistance for an hour; but in the action he himself

206 Attempt to surprise Quebec.

207 Gen. Montgomery killed, and the Americans defeated.

America. received a wound, which obliged him to withdraw. The attack, however, was continued by the officers whom he had left, and another barrier forced: but the garrifon, now perceiving that nothing was to be feared except from that quarter, collected their whole force againft it; and, after a defperate engagement of three hours, overpowered the provincials, and obliged them to furrender.

In this action, it muft be confeffed that the valour of the provincial troops could not be exceeded. They had fought under as great difadvantages as thofe which attended the Britifh at Bunker's Hill, and had behaved equally well. Such a terrible difafter left no hope remaining of the accomplifhment of their purpofe, as General Arnold could now fcarce number 800 effective men under his command. He did not, however, abandon the province, or even remove to a greater diftance than three miles from Quebec; and here he ftill found means to annoy the garrifon very confiderably by intercepting their provifions. The Canadians, notwithftanding the bad fuccefs of the American arms, ftill continued friendly; and thus he was enabled to fuftain the hardfhips of a winter encampment in that moft fevere climate. The congrefs, far from paffing any cenfure on him for his misfortune, created him a brigadier-general.

208 Arnold created a Brigadier-General.

209 Difputes of Lord Dunmore with his province of Virginia.

While hoftilities were thus carried on with vigour in the north, the flame of contention was gradually extending itfelf in the fouth. Lord Dunmore, the governor of Virginia, was involved in difputes fimilar to thofe which had taken place in other colonies. Thefe had proceeded fo far that the affembly was diffolved; which in this province was attended with a confequence unknown to the reft. As Virginia contained a great number of flaves, it was neceffary that a militia fhould be kept conftantly on foot to keep them in awe. During the diffolution of the affembly the militia-laws expired; and the people, after complaining of the danger they were in from the negroes, formed a convention, which enacted that each county fhould raife a quota for the defence of the province. Dunmore, on this, removed the powder from Williamfburg; which created fuch difcontents, that an immediate quarrel would probably have enfued, had not the merchants of the town undertaken to obtain fatisfaction for the injury fuppofed to be done to the community. This tranquillity, however, was foon interrupted; the people, alarmed by a report that an armed party were on their way from the man of war where the powder had been depofited, affembled in arms, and determined to oppofe by force any farther removals. In fome of the conferences which paffed at this time, the governor let fall fome unguarded expreffions, fuch as threatening them with fetting up the royal ftandard, proclaiming liberty to the negroes, deftroying the town of Williamfburg, &c. which were afterwards made public, and exaggerated in fuch a manner as greatly to increafe the public ferment.

The people now held frequent affemblies. Some of them took up arms with a defign to force the governor to reftore the powder, and to take the public money into their own poffeffion: but on their way to Williamfburg for this purpofe, they were met by the receiver-general, who became fecurity for the payment of the gun-powder, and the inhabitants promifed to take care of the magazine and public revenue. America.

By this infurrection the governor was fo much intimidated, that he fent his family on board a man of war. He himfelf, however, iffued a proclamation, in which he declared the behaviour of the perfon who promoted the tumult treafonable, accufed the people of diffafection, &c. On their part they were by no means deficient in recriminating; and fome letters of his to Britain being about the fame time difcovered, confequences enfued extremely fimilar to thofe which had been occafioned by thofe of Mr Hutchinfon at Bofton.

210 He fends his family aboard a man of war.

In this ftate of confufion the governor thought it neceffary to fortify his palace with artillery, and procure a party of marines to guard it. Lord North's conciliatory propofal arriving alfo about the fame time, he ufed his utmoft endeavours to caufe the people comply with it. The arguments he ufed were fuch as muft do him honour; and had not matters already gone to fuch a pitch of diftraction, it is highly probable that fome attention would have been paid to them. "The view (he faid) in which the colonies ought to behold this conciliatory propofal, was no more than an earneft admonition from Great Britain to relieve her wants: that the utmoft condefcendence had been ufed in the mode of application; no determinate fum having been fixed, as it was thought moft worthy of Britifh generofity to take what they thought could be conveniently fpared, and likewife to leave the mode of raifing it to themfelves," &c. But the clamour and diffatisfaction were now fo univerfal, that nothing elfe could be attended to. The governor had called an affembly for the purpofe of laying this conciliatory propofal before them; but it had been little attended to. The affembly began their feffion by inquiries into the ftate of the magazine. It had been broken into by fome of the townfmen; for which reafon fpring-guns had been placed there by the governor, which difcharged themfelves upon the offenders at their entrance: thefe circumftances, with others of a fimilar kind, raifed fuch a violent uproar, that as foon as the preliminary bufinefs of the feffion was over, the governor retired on board a man of war, informing the affembly that he durft no longer truft himfelf on fhore. This produced a long courfe of difputation, which ended in a pofitive refufal of the governor to truft himfelf again in Williamfburg, even to give his affent to the bills, which could not be paffed without it, and though the affembly offered to bind themfelves for his perfonal fafety. In his turn he requefted them to meet him on board the man of war, where he then was; but this propofal was rejected, and all further correfpondence containing the leaft appearance of friendfhip was difcontinued.

211 Fortifies his palace.

212 His arguments for L. North's conciliatory plan.

213 The governor retires on board a man of war.

Lord Dunmore, thus deprived of his government, attempted to reduce by force thofe whom he could no longer govern. Some of the moft ftrenuous adherents to the Britifh caufe, whom their zeal had rendered obnoxious at home, now repaired to him. He was alfo joined by numbers of black flaves. With thefe, and the affiftance of the Britifh fhipping, he was for fome time enabled to carry on a kind of predatory war fufficient to hurt and exafperate, but not to fubdue. After fome inconfiderable attempts on land, proclaim-

214 Attempts to reduce the colony by force.

ing

America. ing liberty to the flaves, and fetting up the royal ftandard, he took up his refidence at Norfolk, a maritime town of fome confequence, where the people were better affected to Britain than in moft other places. A confiderable force, however, was collected againft him;
215 and the natural impetuofity of his temper prompting him to act againft them with more courage than caution, he was entirely defeated, and obliged to retire to his fhipping, which was now crowded by the number of thofe who had incurred the refentment of the provincials.

Ut is entirely defeated.

216 In the mean time a fcheme of the utmoft magnitude and importance was formed by one Mr Conally, a Penfylvanian of an intrepid and afpiring difpofition, and attached to the caufe of Britain. The firft ftep of this plan was to enter into a league with the Ohio Indians. This he communicated to Lord Dunmore, and it received his approbation: Upon which Conolly fet out, and actually fucceeded in his defign. On his return he was difpatched to General Gage, from whom he received a colonel's commiffion, and fet out in order to accomplifh the remainder of his fcheme. The plan in general was, that he fhould return to the Ohio, where, by the affiftance of the Britifh and Indians in thefe parts, he was to penetrate through the back-fettlements into Virginia, and join Lord Dunmore at Alexandria. But by an accident very naturally to be expected, he was difcovered, taken prifoner, and thrown into a dungeon.

Mr Conolly's plan for reducing Virginia.

217 He is difcovered and taken prifoner.

After the retreat of Lord Dunmore from Norfolk, that place was taken poffeffion of by the provincials, who treated the loyalifts that had remained there with great cruelty; at the fame time that they greatly diftreffed thofe on board Lord Dunmore's fleet, by refufing to fupply them with any neceffaries. Nor was this all; the vicinity of the fhipping was fo great as to afford the riflemen an opportunity of aiming at the people on board, and exercifing the cruel occupation of killing them, in which they did not fail every day to employ themfelves. Thefe proceedings at laft drew a remonftrance from his Lordfhip; in which he infifted that the fleet fhould be furnifhed with neceffaries, and that the foldiers fhould defift from the cruel diverfion above-mentioned; but both thefe requefts being denied, a refolution was taken to fet fire to the town. After giving the inhabitants proper warning, a party landed, under cover of a man of war, and fet fire to that part which lay neareft the fhore; but the flames were obferved at the fame time to break forth in every other quarter, and the whole town was reduced to afhes. This univerfal deftruction, by which a lofs of more than L. 300,000 was incurred, is faid to have been occafioned by order of the congrefs itfelf, that the loyalifts might find no refuge there for the future.

218 Cruelty of the Americans.

219 The town of Norfolk deftroyed.

220 In the fouthern colonies of Carolina the governors were expelled and obliged to take refuge on board of men of war, as Lord Dunmore had been; Mr Martin, governor of North Carolina, on a charge of attempting to raife the back-fettlers, confifting chiefly of Scots Highlanders, againft the colony. Having fecured themfelves againft any attempts from thefe enemies, however, they proceeded to regulate their internal concerns in the fame manner as the reft of the colonies; and by the end of the year 1775, Britain beheld the whole of America united againft her in the moft determined oppofition.

The governors of South and North Carolina expelled.

Her vaft poffeffions of that tract of land (fince known by the name of the *Thirteen United States*) were now reduced to the fingle town of Bofton; in which her forces were befieged by an enemy with whom they were apparently not able to cope, and by whom they muft of courfe expect in a very fhort time to be expelled. The fituation of the inhabitants of Bofton, indeed, was peculiarly unhappy. After having failed in their attempts to leave the town, general Gage had confented to allow them to retire with their effects; but afterwards, for what reafon does not well appear, he refufed to fulfil his promife. When he refigned his place to general Howe in October 1775, the latter, apprehenfive that they might give intelligence of the fituation of the Britifh troops, ftrictly prohibited any perfon from leaving the place under pain of military execution. Thus matters continued till the month of March 1776, when the town was evacuated. America.

221 Miferable fituation of the inhabitants of Bofton.

On the 2d of that month, General Wafhington opened a battery on the weft fide of the town, from whence it was bombarded with a heavy fire of cannon at the fame time; and three days after, it was attacked by another battery from the eaftern fhore. This terrible attack continued for 14 days without intermiffion; when General Howe, finding the place no longer tenible, determined if poffible to drive the enemy from their works. Preparations were therefore made for a moft vigorous attack, on an hill called Dorchefter Neck, which the Americans had fortified in fuch a manner as would in all probability have rendered the enterprize next to defperate. No difficulties, however, were fufficient to daunt the fpirit of the general; and every thing was in readinefs, when a fudden ftorm prevented this intended exertion of Britifh valour. Next day, upon a more clofe infpection of the works they were to attack, it was thought advifable to defift from the enterprize altogether. The fortifications were very ftrong, and extremely well provided with artillery; and befides other implements of deftruction, upwards of 100 hogfheads of ftones were provided to roll down upon the enemy as they came up; which, as the afcent was extremely fteep, muft have done prodigious execution.

222 Bofton feverely cannonaded by the provincials.

Nothing therefore now remained but to think of a retreat; and even this was attended with the utmoft difficulty and danger. The Americans, however, knowing that it was in the power of the Britifh general to reduce the town to afhes, which could not have been repaired in many years, did not think proper to give the leaft moleftation; and for the fpace of a fortnight the troops were employed in the evacuation of the place, from whence they carried along with them 2000 of the inhabitants, who durft not ftay on account of their attachment to the Britifh caufe. From Bofton they failed to Halifax; but all their vigilance could not prevent a number of valuable fhips from falling into the hands of the enemy. A confiderable quantity of cannon and ammunition had alfo been left at Bunker's Hill and Bofton Neck; and in the town, an immenfe variety of goods, principally woollen and linen, of which the provincials ftood very much in need. The eftates of thofe who fled to Halifax were confifcated; as alfo thofe who were attached to government, and had remained in the town. As an attack was expected as foon as the Britifh forces fhould arrive, every method was

223 The place evacuated.

America.

was employed to render the fortifications, already very ſtrong, impregnable. For this purpoſe ſome foreign

224 Its fortifications ſtrengthened.

engineers were employed, who had before arrived at Boſton; and ſo eager were people of all ranks to accompliſh this buſineſs, that every able-bodied man in the place, without diſtinction of rank, ſet apart two days in the week, to complete it the ſooner.

225 Congreſs declare the States of America independent.

The Americans, exaſperated to the utmoſt by the proceedings of parliament, now formally renounced all connection with Britain, and declared themſelves independent. This celebrated declaration was publiſhed on the 4th of July 1776. Previous to this a circular letter had been ſent through each colony, ſtating the reaſons for it; and ſuch was the animoſity now every where prevailing againſt Great Britain, that it met with univerſal approbation, except in the province of Maryland alone. It was not long, however, before the people of that colony, finding themſelves left in a very dangerous minority, thought proper to accede to the meaſures of the reſt. The manifeſto itſelf was much in the uſual ſtyle, ſtating a long liſt of grievances, for which redreſs had been often applied in vain; and for theſe reaſons they determined on a final ſeparation; to hold the people of Britain as the reſt of mankind, "enemies in war, in peace friends."

After thus publicly throwing off all allegiance and hope of reconciliation, the coloniſts ſoon found that an exertion of all their ſtrength was required in order to ſupport their pretenſions. Their arms, indeed, had not, during this ſeaſon, been attended with ſucceſs in Canada. Reinforcements had been promiſed to Colonel Arnold, who ſtill continued the blockade of Quebec;

226 The ſiege of Quebec ſtill continued.

but they did not arrive in time to ſecond his operations. Being ſenſible, however, that he muſt either deſiſt from the enterprize, or finiſh it ſucceſsfully, he recommenced in form; attempting to burn the ſhipping, and even to ſtorm the town itſelf. They were unſucceſsful, however, by reaſon of the ſmallneſs of their number, though they ſucceeded ſo far as to burn a number of houſes in the ſuburbs; and the garriſon were obliged to pull down the remainder, in order to prevent the fire from ſpreading.

As the provincials, though unable to reduce the town, kept the garriſon in continual alarms, and in a very diſagreeable ſituation, ſome of the nobility col-

227 Canadians defeated by the provincials;

lected themſelves into a body under the command of one Mr Beaujeu, in order to relieve their capital; but they were met on their march by the provincials, and ſo entirely defeated, that they were never afterwards able to attempt any thing. The Americans, however, had but little reaſon to plume themſelves on this ſucceſs. Their want of artillery at laſt convinced them, that it was impracticable in their ſituation to reduce a place ſo ſtrongly fortified: the ſmall-pox at the ſame time made its appearance in their camp, and carried off great numbers; intimidating the reſt to ſuch a degree, that they deſerted in crowds. To add to their misfortunes, the Britiſh reinforcements unexpectedly appeared, and the ſhips made their way through the ice with ſuch celerity, that the one part

228 Who are in their turn defeated by General Carleton.

of their army was ſeparated from the other; and General Carleton ſallying out as ſoon as the reinforcement was landed, obliged them to fly with the utmoſt precipitation, leaving behind them all their cannon and military ſtores; at the ſame time that their ſhipping was entirely captured by veſſels ſent up the river for that purpoſe. On this occaſion the provincials fled with ſuch precipitation that they could not be overtaken; ſo that none fell into the hands of the Britiſh excepting the ſick and wounded. General Carleton now gave a ſignal inſtance of his humanity: Being well appriſed

229 Humanity of the Britiſh general.

that many of the provincials had not been able to accompany the reſt in their retreat, and that they were concealed in woods, &c. in a very deplorable ſituation, he generouſly iſſued a proclamation, ordering proper perſons to ſeek them out, and give them relief at the public expence; at the ſame time leſt, through fear of being made priſoners, they ſhould refuſe theſe offers of humanity, he promiſed that, as ſoon as their ſituation enabled them, they ſhould be at liberty to depart to their reſpective homes.

230 He purſues the provincials.

The Britiſh general, now freed from any danger of an attack, was ſoon enabled to act offenſively againſt the provincials, by the arrival of the forces deſtined for that purpoſe from Britain. By theſe he was put at the head of 12,000 regular troops, among whom were thoſe of Brunſwick. With this force he inſtantly ſet out to the Three Rivers, where he expected that Arnold would have made a ſtand; but he had fled to Sorel, a place 150 miles diſtant from Quebec, where he was at laſt met by the reinforcements ordered by congreſs. Here, though the preceding events were by no means calculated to inſpire much military ardour, a very daring enterpriſe was undertaken; and this was, to ſurpriſe the Britiſh troops poſted here under General Fraſer and Neſbit; of whom the former commanded thoſe on land, the latter ſuch as were on board of tranſports and were but a little way diſtant. The enterpriſe was undoubtedly very hazardous, both on account of the ſtrength of the parties againſt whom they were to act, and as the main body of the Britiſh forces were advanced within 50 miles of the place; beſides that a number of armed veſſels and tranſports with troops lay between them and the Three Rivers. Two

231 General Thomſon defeated and taken priſoner by General Fraſer.

thouſand choſen men, however, under General Thomſon, engaged in this enterpriſe. Their ſucceſs was by no means anſwerable to their ſpirit and valour. Though they paſſed the ſhipping without being obſerved, General Fraſer had notice of their landing; and thus being prepared to receive them, they were ſoon thrown into diſorder, at the ſame time that General Neſbit, having landed his forces, prepared to attack them in the rear. On this occaſion ſome field-pieces did prodigious execution, and a retreat was found to be unavoidable. General Neſbit, however, had got between them and their boats; ſo that they were obliged to take a circuit through a deep ſwamp, while they were hotly purſued by both parties at the ſame time, who marched for ſome miles on each ſide of the ſwamp, till at laſt the miſerable provincials were ſheltered from further danger by a wood at the end of the ſwamp. Their general, however, was taken, with 200 of his men.

232 The provincials purſued by Gen. Burgoyne;

By this diſaſter the provincials loſt all hopes of accompliſhing any thing in Canada. They demoliſhed their works, and carried off their artillery with the utmoſt expedition. They were purſued, however, by General Burgoyne; againſt whom it was expected that they would have collected all their force, and made a reſolute ſtand. But they were now too much diſpirit-

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 ed by miſfortune, to make any further exertions of valour. On the 18th of June the Britiſh general arrived at Fort St John's, which he found abandoned and burnt. Chamblee had ſhared the ſame fate, as well as all the veſſels that were not capable of being dragged up againſt the current of the river. It was thought that they would have made ſome reſiſtance at Nut Iſland, the entrance to Lake Champlain; but this alſo they had abandoned, and retreated acroſs the lake to Crown Point, whither they could not be immediately followed. Thus was the province of Canada entirely evacuated by the Americans; whoſe loſs in their retreat from Quebec was not calculated at leſs than 1000 men, of whom 400 fell at once into the hands of the enemy at a place called the Cedars, about 50 miles above Montreal. General Sullivan, however, who conducted this retreat after the affair of General Thomſon, was acknowledged to have had great merit in what he did, and received the thanks of congreſs accordingly.

233 But eſcape to Crown Point.

This bad ſucceſs in the north, however, was ſomewhat compenſated by what happened in the ſouthern colonies.—We have formerly taken notice that Mr Martin, governor of North Carolina, had been obliged to leave his province and take refuge on board a man of war. Notwithſtanding this, he did not deſpair of reducing it again to obedience. For this purpoſe he applied to the Regulators, a daring ſet of banditti, who lived in a kind of independent ſtate; and though conſidered by government as rebels, yet had never been moleſted, on account of their numbers and known ſkill in the uſe of fire-arms. To the chiefs of theſe people commiſſions were ſent, in order to raiſe ſome regiments; and Colonel Macdonald, a brave and enterpriſing officer, was appointed to command them. In the month of February he erected the king's ſtandard, iſſued proclamations, &c. and collected ſome forces, expecting to be ſoon joined by a body of regular troops, who were known to be ſhipped from Britain to act againſt the ſouthern colonies. The Americans, ſenſible of their danger, diſpatched immediately what forces they had to act againſt the royaliſts, at the ſame time that they diligently exerted themſelves to ſupport theſe with ſuitable reinforcements. Their preſent force was commanded by a General Moore, whoſe numbers were inferior to Macdonald; for which reaſon the latter ſummoned him to join the king's ſtandard under pain of being treated as a rebel. But Moore, being well provided with cannon, and conſcious that nothing could be attempted againſt him, returned the compliment, by acquainting Colonel Macdonald, that if he and his party would lay down their arms, and ſubſcribe an oath of fidelity to congreſs, they ſhould be treated as friends; but if they perſiſted in an undertaking for which it was evident they had not ſufficient ſtrength, they could not but expect the ſevereſt treatment. In a few days General Moore found himſelf at the head of 8000 men, by reaſon of the continual ſupplies which daily arrived from all parts. The royal party amounted only to 2000, and they were deſtitute of artillery, which prevented them from attacking the enemy while they had the advantage of numbers. They were now therefore obliged to have recourſe to a deſperate exertion of perſonal valour; by dint of which they effected a retreat for 80 miles to Moore's Creek, within 16 miles of Wilmington. Could they have gained this place, they expected to have been joined by Governor Martin and General Clinton, who had lately arrived with a conſiderable detachment. But Moore with his army purſued them ſo cloſe, that they were obliged to attempt the paſſage of the Creek itſelf, though a conſiderable body of the enemy, under the command of Colonel Coſwell, with fortifications well planted with cannon, was poſted on the other ſide. On attempting the Creek, however, it was found not to be fordable. They were obliged therefore to croſs over a wooden bridge, which the provincials had not time to deſtroy entirely. They had, however, by pulling up part of the planks, and greaſing the remainder in order to render them ſlippery, made the paſſage ſo difficult, that the royaliſts could not attempt it. In this ſituation they were, on the 27th of February, attacked by Moore with his ſuperior army, and totally defeated with the loſs of their general and moſt of their leaders, as well as the beſt and braveſt of their men.

234 An inſurrection in North Carolina in favour of Britain.

235 The royaliſts entirely defeated.

Thus was the power of the provincials eſtabliſhed in North Carolina. Nor were they leſs ſucceſsful in the province of Virginia; where Lord Dunmore, having long continued an uſeleſs predatory war, was at laſt driven from every creek and road in the province. The people he had on board were diſtreſſed to the higheſt degree by confinement in ſmall veſſels. The heat of the ſeaſon, and the numbers crowded together, produced a peſtilential fever, which made great havock, eſpecially among the blacks. At laſt, finding themſelves in the utmoſt hazard of periſhing by famine as well as diſeaſe, they ſet fire to the leaſt valuable of their veſſels, reſerving only about 50 for themſelves, in which they bid a final adieu to Virginia, ſome ſailing to Florida, ſome to Bermuda, and the reſt to the Weſt Indies.

236 Lord Dunmore finally driven out of Virginia.

In South Carolina the provincials had a more formidable enemy to deal with. A ſquadron, whoſe object was the reduction of Charleſtown, had been fitted out in December 1775; but by reaſon of unfavourable weather did not reach Cape Fear in North Carolina till the month of May 1776: and here it met with further obſtacles till the end of the month. Thus the Americans, always noted for their alertneſs in raiſing fortifications, had time to ſtrengthen thoſe of Charleſtown in ſuch a manner as rendered it extremely difficult to be attacked. The Britiſh ſquadron conſiſted of two 50 gun ſhips, four of 30 guns, two of 20, an armed ſchooner and bomb-ketch; all under the command of Sir Peter Parker. The land forces were commanded by Lord Cornwallis, with Generals Clinton and Vaughan. As they had yet no intelligence of the evacuation of Boſton, General Howe diſpatched a veſſel to Cape Fear with ſome inſtructions; but it was too late; and in the beginning of June the ſquadron anchored off Charleſtown bar. Here they met with ſome difficulty in croſſing, being obliged to take out the guns from the two large ſhips, which were, notwithſtanding, ſeveral times in danger of ſticking faſt. The next obſtacle was a ſtrong fort on Sullivan's iſland, ſix miles eaſt from Charleſtown; which, though not completely finiſhed, was very ſtrong. However, the Britiſh generals reſolved without heſitation to attack it; but though an attack was eaſy from the ſea, it was very difficult to obtain a co-operation of the land forces. This was attempted by landing them on

237 Britiſh armament ſent againſt Charleſtown.

 Long

America.

Long Island, adjacent to Sullivan's island on the east, from which it is separated by a very narrow creek, said not to be above two feet deep at low water. Opposite to this ford the provincials had posted a strong body of troops, with cannon and intrenchments; while General Lee was posted on the main land, with a bridge of boats betwixt that and Sullivan's island, so that he could at pleasure send reinforcements to the troops in the fort on Sullivan's island.

On the part of the British, so many delays occurred, that it was the 28th of June before matters were in readiness for an attack; and by this time the provincials had abundantly provided for their reception. On the morning of that day the bomb-ketch began to throw shells into Fort Sullivan, and about mid-day the two 50 gun ships and 30 gun frigates came up and began a severe fire. Three other frigates were ordered to take their station between Charlestown and the fort, in order to enfilade the batteries, and cut off the communication with the main land; but through the ignorance of the pilots they all stuck fast; and though two of them were disentangled, they were found to be totally unfit for service: the third was burnt, that she might not fall into the hands of the enemy.

238 The fleet make a furious attack.

The attack was therefore confined to the five armed ships and bomb-ketch, between whom and the fort a dreadful fire ensued. The Bristol suffered excessively. The springs on her cable being shot away, she was for some time entirely exposed to the enemy's fire. As the enemy poured in great quantities of red-hot balls, she was twice in flames. The captain (Mr Morris) after receiving five wounds, was obliged to go below deck in order to have his arm amputated. After undergoing this operation he returned to his place, where he received another wound, but still refused to quit his station: at last he received a red-hot ball in his belly, which instantly put an end to his life. Of all the officers and seamen who stood on the quarter-deck of this vessel, not one escaped without a wound excepting Sir Peter Parker alone; whose intrepidity and presence of mind on this occasion was very remarkable.

239 Bravery of Captain Morris.

240 The British repulsed.

The engagement lasted till darkness put an end to it. Little damage was done by the British, as the works of the enemy lay so low that many of the shot flew over; and the fortifications, being composed of palm-trees mixed with earth, were extremely well calculated to resist the impression of cannon. During the height of the attack, the provincial batteries remained for some time silent, so that it was concluded that they had been abandoned; but this was found to proceed only from want of powder; for as soon as a supply of this necessary article was obtained, the firing was resumed as brisk as before. During the whole of this desperate engagement it was found impossible for the land-forces to give the least assistance to the fleet. The enemy's works were found to be much stronger than they had been imagined, and the depth of water effectually prevented them from making any attempt. In this unsuccessful attack the killed and wounded on the part of the British amounted to about 200. The Bristol and Experiment were so much damaged, that it was thought they could not have been got over the bar; however, this was at last accomplished by a very great exertion of naval skill, to the surprise of the provincials, who had expected to make them both prizes. On the American side the loss was judged to have been very considerable, as most of their guns were dismounted, and reinforcements had poured into the fort during the whole time of the action.

241 Americans form a navy.

This year also, the Americans, having so frequently made trial of their valour by land, became desirous of trying it by sea also, and of forming a navy that might in some measure be able to protect their trade, and do essential hurt to the enemy. In the beginning of March Commodore Hopkins was dispatched with five frigates to the Bahama islands, where he made himself master of the ordnance and military stores; but the gunpowder, which had been the principal object, was removed. On his return he captured several vessels; but was foiled in his attempt on the Glasgow frigate, which found means to escape notwithstanding the efforts of his whole squadron.

The time, however, was now come when the fortitude and patience of the Americans were to undergo a severe trial. Hitherto they had been on the whole successful in their operations: but now they were doomed to experience misfortune, misery, and disgrace; the enemy over-running their country, and their own armies not able to face them in the field. The province of New York, as being the most central colony, and most accessible by sea, was pitched upon for the object of the main attack. The force sent against it consisted of 6 ships of the line, 30 frigates, besides other armed vessels, and a vast number of transports. The fleet was commanded by Lord Howe, and the land forces by his brother General Howe, who was now at Halifax. The latter, however, a considerable time before his brother arrived, had set sail from Halifax, and lay before New York, but without attempting to commence hostilities until he should be joined by his brother. The Americans had, according to custom, fortified New York and the adjacent islands in an extraordinary manner. However, General Howe was suffered to land his troops on Staten Island, where he was soon joined by a number of the inhabitants. About the middle of July, Lord Howe arrived with the grand armament; and being one of the commissioners appointed to receive the submission of the colonists, he published a circular letter to this purpose to the several governors who had lately been expelled from their provinces, desiring them to make the extent of his commission, and the powers he was invested with by parliament, as public as possible. Here, however, congress saved him trouble, by ordering his letter and declaration to be published in all the newspapers, that every one, as they said, might see the insidiousness of the British ministry, and that they had nothing to trust to besides the exertion of their own valour.

242 Armament sent against New York.

243 General Howe lands on Staten island.

244 General Washington refuses a letter from Lord Howe.

Lord Howe next sent a letter to General Washington; but as it was directed "To George Washington, Esq;" the General refused to accept of it, as not being directed in the style suitable to his station. To obviate this objection, Adjutant-general Paterson was sent with another letter, directed "To George Washington, &c. &c. &c." But though a very polite reception was given to the bearer, General Washington utterly refused the letter; nor could any explanation of the Adjutant induce him to accept of it. The only interesting part of the conversation was that relating to the powers of the commissioners, of which Lord Howe was

America. was one. The adjutant told him, that thefe powers were very extenfive; that the commiffioners were determined to exert themfelves to the utmoft, in order to bring about a reconciliation; and that he hoped the general would confider this vifit as a ftep towards it. General Wafhington replied, that it did not appear that thefe powers confifted in any thing elfe than granting pardons; and as America had committed no offence, fhe afked no forgivenefs, and was only defending her unqueftionable rights.

245 Hoftilities commence. The decifion of every thing being now by confent of both parties left to the fword, no time was loft, but hoftilities commenced as foon as the Britifh troops could be collected. This, however, was not done before the month of Auguft, when they landed without any oppofition on Long Ifland, oppofite to the fhore of Staten Ifland. General Putnam, with a large body of troops, lay encamped and ftrongly fortified on a peninfula on the oppofite fhore, with a range of hills between the armies, the principal pafs of which was near a place called *Flat-bufh*. Here the centre of the Britifh army, confifting of Heffians, took poft; the left wing, under General Grant, lying near the fhore; and the right, confifting of the greater part of the Britifh forces, lay under Lord Percy, Cornwallis, and General Clinton. Putnam had ordered the paffes to be fecured by large detachments, which was executed as to thofe at hand; but one of the utmoft importance, that lay at a diftance, was entirely neglected. This gave an opportunity to a large body of troops under Lord Percy and Clinton to pafs the mountains and attack the Americans in the rear, while they were engaged with the Heffians in front. Through this piece of negligence their defeat became inevitable. Thofe who were engaged with the Heffians firft perceived their miftake, and began a retreat towards their camp; but the paffage was intercepted by the Britifh troops, who drove them back into the woods. Here they were met by the Heffians; and thus were they for many hours flaughtered between the two parties, no way of efcape remaining but by breaking through the Britifh troops, and thus regaining their camp. In this attempt many perifhed; and the right wing, engaged with General Grant, fhared the fame fate. The victory was complete; and the Americans loft on this fatal day (Auguft 27th) between 3000 and 4000 men, of whom 2000 were killed in the battle or purfuit. Among thefe a regiment, confifting of young gentlemen of fortune and family in Maryland, was almoft entirely cut in pieces, and of the furvivors not one efcaped without a wound.

246 Situation of the Britifh and American armies.

247 The Americans defeated with great flaughter.

The ardour of the Britifh troops was now fo great, that they could fcarce be reftrained from attacking the lines of the provincials; but for this there was now no occafion, as it was certain they could not be defended. Of the Britifh only 61 were killed in this engagement, and 257 wounded. Eleven hundred of the enemy, among whom were three generals, were taken prifoners.

248 They abandon their camp in the night. As none of the American commanders thought it proper to rifk another attack, it was refolved to abandon their camp as foon as poffible. Accordingly on the night of the 29th of Auguft, the whole of the continental troops were ferried over with the utmoft fecrecy and filence; fo that in the morning the Britifh had nothing to do but take poffeffion of the camp and artillery which they had abandoned.

249 Lord Howe fends a meffage to congrefs. This victory, though complete, was very far from being fo decifive as the conquerors imagined. Lord Howe, fuppofing that it would be fufficient to intimidate the congrefs into fome terms, fent general Sullivan, who had been taken prifoner in the late action, to congrefs, with a meffage, importing, that though he could not confiftently treat with them as a legal affembly, yet he would be very glad to confer with any of the members in their private capacity; fetting forth at the fame time the nature and extent of his powers as commiffioner. But the congrefs were not as yet fufficiently humbled to derogate in the leaft from the dignity of character they had affumed. They replied, that the congrefs of the free and independent ftates of America could not confiftently fend any of its members in another capacity than that which they had publicly affumed; but as they were extremely defirous of reftoring peace to their country upon equitable conditions, they would appoint a committee of their body to wait upon him, and learn what propofals he had to make. 250 And is waited on by a committee.

This produced a new conference. The committee appointed by congrefs was compofed of Dr Franklin, Mr Adams, and Mr Rutledge. They were very politely received by his Lordfhip; but the conference proved as fruitlefs as before independency had been declared; and the final anfwer of the deputies was, that they were extremely willing to enter into any treaty with Great Britain that might conduce to the good of both nations, but that they would not treat in any other character than that of independent ftates. This pofitive declaration inftantly put an end to all hopes of reconciliation; and it was refolved to profecute the war with the utmoft vigour. 251 The conference terminates ineffectually. Lord Howe, after publifhing a manifefto, in which he declared the refufal of congrefs, and that he himfelf was willing to confer with all well difpofed perfons about the means of reftoring public tranquillity, fet about the moft proper methods for reducing the city of New York. Here the provincial troops were pofted, and from a great number of batteries kept continually annoying the Britifh fhipping. The Eaft River lay between them, of about 1200 yards in breadth, which the Britifh troops were extremely defirous of paffing. At laft the fhips having, after an inceffant cannonade of feveral days, filenced the moft troublefome batteries, a body of troops was fent up the river to a bay, about three miles diftant, where the fortifications were lefs ftrong than in other places. Here having driven off the provincials by the cannon of the fleet, they marched directly towards the city; but the enemy finding that they fhould now be attacked on all fides, abandoned the city, and retired to the north of the ifland, where their principal force was collected. 252 New York abandoned by the provincials. In their paffage thither they fkirmifhed with the Britifh, but carefully avoided a general engagement; and it was obferved that they did not behave with that ardour and impetuous valour which had hitherto marked their character.

253 Situation of the Britifh and American armies. The Britifh and provincial armies were not now above two miles diftant from each other. The former lay encamped from fhore to fhore for an extent of two miles, being the breadth of the ifland, which though 15 miles long, exceeds not two in any part in breadth. The provincials, who lay directly oppofite, had ftrengthened

America.

ened their camp with many fortifications; at the same time, being masters of all the passes and defiles betwixt the two camps, they were enabled to defend themselves against an army much more numerous than their own; and they had also strongly fortified a pass called *King's Bridge*, whence they could secure a passage to the continent in case of any misfortune. Here general Washington, in order to inure the provincials to actual service, and at the same time to annoy the enemy as much as possible, employed his troops in continual skirmishes; by which it was observed that they soon recovered their spirits, and behaved with their usual boldness.

As the situation of the two armies was now highly inconvenient for the British generals, it was resolved to make such movements as might oblige general Washington to relinquish his strong situation. The possession of New York had been less beneficial than was expected. It had been concerted among the provincials, that the city should be burnt at the time of evacuation; but as they were forced to depart with precipitation,
254 New York set on fire by the provincials.
they were prevented from putting the scheme in execution. In a few days, however, it was attempted by some who had been left behind for that purpose. Taking advantage of a high wind and dry weather, the town was set on fire in several places at once, by means of combustibles properly placed for that purpose; and notwithstanding the most active exertions of the soldiery and sailors, a fourth part of the city was consumed.

On this occasion the British were irritated to the highest degree; and many persons, said to be incendiaries, were without mercy thrown into the flames. It was determined to force the provincial army to a greater distance, that they might have it less in their power, by any emissaries, to engage others in a similar attempt. For this purpose, general Howe having left Lord Percy with sufficient force to garrison New York, he em-
255 General Washington obliged to move farther from New York.
barked his army in flat-bottomed boats, by which they were conveyed thro' the dangerous passage called *Hell-Gate*, and landed near the town of West Chester, lying on the continent towards Connecticut. Here having received a supply of men and provisions, they moved to New Rochelle, situated on the sound which separates Long Island from the continent. After this, receiving still fresh reinforcements, they made such movements as threatened to distress the provincials very much, by cutting off their convoys of provisions from Connecticut, and thus force them to an engagement. This, however, General Washington determined at all events to avoid. He therefore extended his forces into a long line opposite to the way in which the enemy marched, keeping the Bruna, a river of considerable magnitude, between the two armies, with the North River on his rear. Here again the provincials continued for some time to annoy and skirmish with the Royal army, until at last, by some other manoeuvres,
256 Is defeated at the White Plains.
the British general found means to attack them advantageously at a place called the *White Plains*, and drove them from some of their posts. The victory on this occasion was much less complete than the former; however it obliged the provincials once more to shift their ground, and to retreat farther up the country. General Howe pursued for some time; but at last finding all his endeavours vain to bring the Americans to a pitched battle, he determined to give over such an useless chace, and employ himself in reducing the forts which the provincials still retained in the neighbourhood of New York. In this he met with the most complete success. The Americans, on the approach of the king's forces, retreated from King's Bridge into Fort Washington; and this, as well as Fort Lee, which lay in the neighbourhood, was quickly reduced, though the garrison made their escape. Thus the Jerseys were laid entirely open to the incursions of the British troops; and so fully were these provinces taken possession of by the Royal army, that its winter-quarters extended from New Brunswick to the river Delaware. Had any number of boats been at hand, it is probable that Philadelphia would now have fallen into their hands. All these, however, had been carefully removed by the Americans. In lieu of this enterprise, Sir Henry Clinton undertook an expedition to Rhode-Island, and became master of it without losing a man. His expedition was also attended with this further advantage, that the American fleet under commodore Hopkins was obliged to sail as far as possible up the river Providence, and thus remained entirely useless.

257 The Jerseys entirely overrun by the British troops.

258 Rhode Island taken.

The same ill success continued to attend the Americans in other parts. After their expulsion from Canada, they had crossed the lake Champlain, and taken up their quarters at Crown Point, as we have already mentioned. Here they remained for some time in safety, as the British had no vessels on the lake, and consequently general Burgoyne could not pursue them. To remedy this deficiency, there was no possible method, but either to construct vessels on the spot, or take to pieces some vessels already constructed, and drag them up the river into the lake. This, however, was effected in no longer a space than three months; and the British general, after incredible toil and difficulty, saw himself in possession of a great number of vessels, by which means he was enabled to pursue his enemies, and invade them in his turn. The labour undergone at this time by the sea and land forces must indeed have been prodigious; since there were conveyed over land, and dragged up the rapids of St Laurence, no fewer than 30 large long-boats, 400 batteaux, besides a vast number of flat-bottomed boats, and a gondola of 30 tons. The intent of the expedition was to push forward before winter to Albany, where the army would take up its winter-quarters, and next spring effect a junction with that under general Howe, when it was not doubted that the united force and skill of these two commanders would speedily put a termination to the war.

259 The British convey vessels up the lake Champlain.

By reason of the difficulties with which the equipment of this fleet had been attended, it was the beginning of October before the expedition could be undertaken. It was now, however, by every judge allowed to be completely able to answer the purpose for which it was intended. It consisted of one large vessel with three masts, carrying 18 twelve-pounders; two schooners, the one carrying 14, the other 12 six-pounders; a large flat-bottomed radeau with 6 twenty-four and 6 twelve-pounders; and a gondola with 8 nine-pounders. Besides these were 20 vessels of a smaller size, called *gun-boats*, carrying each a piece of brass ordnance from nine to 24 pounders, or howitzers. Several long-boats were fitted out in the same manner; and besides all these, there was a vast number of boats and tenders of

America. of various fizes, to be ufed as tranfports for the troops and baggage. It was manned by a number of felect feamen, and the guns were to be ferved by a detachment from the corps of artillery; the officers and foldiers appointed for this expedition were alfo chofen out of the whole army.

260 Deftroy the naval force of the provincials.

To oppofe this formidable armament the Americans had only a very inconfiderable force, commanded by general Arnold; who, after engaging part of the Britifh fleet for a whole day, took advantage of the darknefs of the night to fet fail without being perceived, and next morning was out of fight: but he was fo hotly purfued by the Britifh, that on the fecond day after he was overtaken, and forced to a fecond engagement. In this he behaved with great gallantry; but his force being very inferior to that of the enemy, he was obliged to run his fhips afhore and fet them on fire. A few only efcaped to lake George; and the garrifon of Crown Point having deftroyed or carried off every thing of value, retired to Ticonderoga. Thither general Carleton intended to have purfued them; but the difficulties he had to encounter appeared fo many and fo great, that it was thought proper to march back into Canada, and defift from any further operations till next fpring.

261 The Americans almoft entirely difperfed.

Thus the affairs of the Americans feemed every where going to wreck: even thofe who had been moft fanguine in their caufe began to waver. The time, alfo, for which the foldiers had enlifted themfelves was now expired; and the bad fuccefs of the preceding campaign had been fo very difcouraging, that no perfon was willing to engage himfelf during the continuance of a war, of which the event feemed to be fo doubtful. In confequence of this, therefore, General Wafhington found his army daily decreafing in ftrength; fo that from 30,000, of whom it confifted when general Howe landed on Staten Ifland, fcarce a tenth-part could now be muftered. To affift the chief commander as much as poffible, general Lee had collected a body of forces in the north; but on his way fouthward, having imprudently taken up his lodging at fome diftance from his troops, information was given to colonel Harcourt, who happened at that time to be in the neighbourhood, and Lee was made prifoner.

162 General Lee taken prifoner.

The lofs of this general was much regretted, the more efpecially as he was of fuperior quality to any prifoner in the poffeffion of the colonifts, and could not therefore be exchanged. Six field-officers were offered in exchange for him and refufed; and the congrefs was highly irritated at its being reported that he was to be treated as a deferter, having been a half-pay officer in the Britifh fervice at the commencement of the war. In confequence of this they iffued a proclamation, threatening to retaliate on the prifoners in their poffeffion whatever punifhment fhould be inflicted on any of thofe taken by the Britifh, and efpecially that their conduct fhould be regulated by the treatment of general Lee.

In the mean time they proceeded with the moft indefatigable diligence to recruit their army, and bound their foldiers to ferve for a term of three years, or during the continuance of the war.

263 Continental army for 1777.

The army defigned for the enfuing campaign, was to confift of 88 battalions; of which each province was to contribute its quota; and 20 dollars were offered as a bounty to each foldier, befides an allotment of lands at the end of the war. In this allotment it was ftipulated, that each foldier fhould have 100 acres; an enfign 150; a lieutenant 200; a captain 300; a major 400; a lieutenant-colonel 450; and a colonel 500. No lands were promifed to thofe who enlifted only for three years. All officers or foldiers difabled through wounds received in the fervice were to enjoy half-pay during life. To defray the expence, congrefs borrowed five millions of dollars at five per cent.; for payment of which the United States became furety. At the fame time, in order to animate the people to vigorous exertions, a declaration was publifhed, in which they fet forth the neceffity there was for taking proper methods to infure fuccefs in their caufe: they endeavoured to palliate as much as poffible the misfortunes which had already happened; and reprefented the true caufe of the prefent diftrefs to be the fhort term of enliftment. America.

This declaration, together with the imminent danger of Philadelphia, determined the Americans to exert themfelves to the utmoft in order to reinforce general Wafhington's army. They foon received farther encouragement, however, by an exploit of that general againft the Heffians. As the Royal army extended in different cantonments for a great way, general Wafhington, perceiving the imminent danger to which Philadelphia was expofed, refolved to make fome attempt on thofe divifions of the enemy which lay neareft that city. Thefe happened to be the Heffians, who lay in three divifions, the laft only 20 miles diftant from Philadelphia. On the 25th of December, having collected as confiderable a force as he could, he fet out with an intent to furprife that body of the enemy who lay at Trenton. His army was divided into three bodies; one of which he ordered to crofs the Delaware at Trenton Ferry, a little below the town; the fecond at a good diftance below, at a place called *Bordentown*, where the fecond divifion of Heffians was placed; while he himfelf, with the third, directing his courfe to a ferry fome miles above Trenton, intended to have paffed it at midnight, and attack the Heffians at break of day. But by reafon of various impediments, it was eight in the morning before he could reach the place of his deftination. The enemy, however, did not perceive his approach till they were fuddenly attacked. Colonel Ralle, who commanded them, did all that could be expected from a brave and experienced officer; but every thing was in fuch confufion, that no efforts of valour or fkill could now retrieve matters. The Colonel himfelf was mortally wounded, his troops were entirely broken, their artillery feized, and about 1000 taken prifoners.

This action, though feemingly of no very decifive nature, was fufficient at that time to turn the fortune of war in favour of America. It tended greatly to leffen the fear which the provincials had of the Heffians, at the fame time that it equally abated the confidence which the Britifh had till now put in them. Reinforcements came into General Wafhington's army from all quarters; fo that he was foon in a condition to leave Philadelphia, and take up his quarters at Trenton. Emboldened by his fuccefs, he determined to make an attempt on a divifion of the Britifh forces ftationed at Maidenhead, a town fituated half way between Trenton and Princetown. This confifted of three regiments under 264 Another attempt on three Britifh regiments;

America. under the command of Colonel Mawhood, an officer of great merit. The troops were ſurpriſed on their march; but though they were ſeparately ſurrounded and attacked by a force ſo vaſtly ſuperior, they charged the enemy ſo reſolutely with their bayonets, that they effected a retreat. Theſe attempts of the Americans, however, with the hoſtile diſpoſition of the people, ſhowed the impoſſibility of maintaining poſts ſo far advanced in the enemy's country; ſo that it was reſolved to retreat towards Brunſwick, in order to prevent it, with the troops and magazines it contained, from falling into the hands of the provincials. General Waſhington loſt no opportunity of recovering what had been loſt; and by dividing his army into ſmall parties, which could be reunited on a few hours warning, he in a manner entirely covered the country with it, and repoſſeſſed himſelf of all the important places.

265 But they make good their retreat.

Thus ended the campaign of 1776, with ſcarce any real advantage other than the acquiſition of the city of New York, and of a few fortreſſes in its neighbourhood; where the troops were conſtrained to act with as much circumſpection as if they had been beſieged by a victorious army, inſtead of being themſelves the conquerors.

266 Excurſions of the Britiſh from New York

The army at New York began in 1777 to exerciſe a kind of predatory war, by ſending out parties to deſtroy magazines, make incurſions, and take or deſtroy ſuch forts as lay on the banks of rivers, to which their great command of ſhipping gave them acceſs. In this they were generally ſucceſsful: the provincial magazines at Peek's Hill, a place of about 50 miles diſtant from New York, were deſtroyed, the town of Dunbury in Connecticut burnt, and that of Ridgefield in the ſame province was taken poſſeſſion of. In returning from the laſt expedition, however, the Britiſh were greatly haraſſed by the enemy under Generals Arnold, Wooſter, and Sullivan; but they made good their retreat in ſpite of all oppoſition, with the loſs of only 170 killed and wounded. On the American ſide the loſs was much greater; General Wooſter was killed, and Arnold in the moſt imminent danger. On the other hand, the Americans deſtroyed the ſtores at Sagg-harbour, in Long-Iſland, and made priſoners of all who defended the place.

As this method of making war, however, could anſwer but little purpoſe, and favoured more of the barbarous incurſions of ſavages than of a war carried on by a civilized people, it was reſolved to make an attempt on Philadelphia. At firſt it was thought that this could be done through the Jerſeys; but General Waſhington had received ſuch large reinforcements, and poſted himſelf ſo ſtrongly, that it was found to be impracticable. Many ſtratagems were uſed to draw him from this ſtrong ſituation, but without ſucceſs; ſo that it was found neceſſary to make the attempt on Philadelphia by ſea. While the preparations neceſſary for this expedition were going forward, the Americans found means to make amends for the capture of General Lee by that of General Preſcot, who was ſeized in his quarters with his aid de camp, in much the ſame manner as General Lee had been. This was exceedingly mortifying to the General himſelf, as he had not long before ſet a price upon General Arnold, by offering a ſum of money to any one that apprehended him; which the latter anſwered by ſetting a lower price upon General Preſcot.

267 General Preſcot taken priſoner.

The month of July was far advanced before the preparations for the expedition againſt Philadelphia were completed; and it was the 23d before the fleet was able to ſail from Sandy Hook. The force employed in this expedition conſiſted of 36 battalions of Britiſh and Heſſians, a regiment of light horſe, and a body of loyaliſts raiſed at New York. The remainder of theſe, with 17 battalions, and another body of light horſe, were ſtationed at New York under Sir Henry Clinton. Seven battalions were ſtationed at Rhode Iſland. After a week's ſailing they arrived at the mouth of the Delaware; but there received certain intelligence, that the navigation of the river was ſo effectually obſtructed, that no poſſibility of forcing a paſſage remained. Upon this it was reſolved to proceed further ſouthward to Cheſapeak Bay in Maryland, from whence the diſtance to Philadelphia was not very great, and where the provincial army would find leſs advantage from the nature of the country than in the Jerſeys.

268 The fleet ſails for Philadelphia.

The navigation from Delaware to Cheſapeak took up the beſt part of the month of Auguſt, and that up the bay itſelf was extremely difficult and tedious. At laſt, having ſailed up the river Elk, as far as was practicable, the troops were landed without oppoſition, and ſet forward on their intended expedition. On the news of their arrival in Cheſapeak, General Waſhington left the Jerſeys, and haſtened to the relief of Philadelphia; and in the beginning of September met the royal army at Brandy-wine Creek about mid-day, between the head of the Elk and Philadelphia. Here he adhered to his former method of ſkirmiſhing and haraſſing the royal army on its march; but as this proved inſufficient to ſtop its progreſs, he retired to that ſide of the Creek next to Philadelphia, with an intent to diſpute the paſſage. This brought on a general engagement on the 11th September, in which the Americans were worſted through the ſuperior diſcipline of the Britiſh troops; and it was only through the approach of night that they were ſaved from being entirely deſtroyed. On this occaſion the provincials loſt about 1000 in killed and wounded, beſides 400 taken priſoners.

269 The army lands at the head of the Elk.

270 Americans defeated.

The loſs of this battle proved alſo the loſs of Philadelphia. General Waſhington retired towards Lancaſter, an inland town, at a conſiderable diſtance from Philadelphia. Here, however, the Britiſh general took ſuch meaſures as muſt have forced the provincials to a ſecond engagement; but a violent rain which laſted a day and a night prevented his deſign. General Waſhington, though he could not prevent the loſs of Philadelphia, ſtill adhered to his original plan of diſtreſſing the royal party, by laying ambuſhes and cutting off detached parties: but in this he was leſs ſucceſsful than formerly; and one of his own detachments which lay in ambuſh in a wood were themſelves ſurpriſed and entirely defeated, with the loſs of 300 killed and wounded, beſides a great number taken, and all their arms and baggage.

271 An American detachment ſurpriſed and defeated with great ſlaughter.

General Howe now perceiving that the Americans would not venture another battle even for the ſake of their capital, took peaceable poſſeſſion of it on the 26th of September. His firſt care was then to cut off, by means of ſtrong batteries, the communication be-

272 General Howe takes poſſeſſion of Philadelphia.

America. between the upper and lower parts of the river; which was executed notwithſtanding the oppoſition of ſome American armed veſſels; one of which, carrying 36 guns, was taken. His next taſk was to open a communication with it by ſea; and this was a work of no ſmall difficulty. A vaſt number of batteries and forts had been erected, and immenſe machines formed like *chevaux de frize*, from whence they took their name, ſunk in the river to prevent its navigation. As the fleet was ſent round to the mouth of the river in order to co-operate with the army, this work, however difficult, was accompliſhed; nor did the provincials give much oppoſition, as well knowing that all places of this kind were now untenable. General Waſhington, however, took the advantage of the royal army being divided to attack the camp of the principal diviſion of it that lay at German-town in the neighbourhood of Philadelphia. In this he met with very little ſucceſs; for though he reached the place of deſtination by three o'clock in the morning, the patroles had time to call the troops to arms. The Americans, notwithſtanding, made a very reſolute attack: but they were received with ſuch bravery, that they were compelled to abandon the attempt, and retreat in great diſorder; with the advantage, however, of carrying off their cannon, though purſued for a conſiderable way, after having 300 killed, 600 wounded, and upwards of 400 taken priſoners, among whom were 54 officers. On the Britiſh ſide, the loſs amounted to 430 wounded and priſoners, and 70 killed; but among the laſt were General Agnew and Colonel Bird, with ſome other excellent officers.

273 Royal army attacked at German-town.

274 The Americans defeated.

There ſtill remained two ſtrong forts on the Delaware to be reduced. Theſe were Mud Iſland and Red Bank. The various obſtructions which the Americans had thrown in the way rendered it neceſſary to bring up the Auguſta, a ſhip of the line, and the Merlin frigate, to the attack of Mud Iſland; but during the heat of action both were grounded. Upon this, the Americans ſent down four fire-ſhips, and directed the whole fire from their galleys againſt them. The former were rendered ineffectual by the courage and ſkill of the Britiſh ſeamen; but during the engagement both the Auguſta and Merlin took fire and were burnt to aſhes, and the other ſhips obliged to withdraw. The enemy, encouraged by this unſucceſsful attempt, proceeded to throw new obſtructions in the way; but the Britiſh general having found means to convey a number of cannon and to erect batteries within a gunſhot of the fort by land, and bringing up three ſhips of the line which mounted heavy cannon, the garriſon, after making a vigorous defence for one day, perceiving that preparations were making for a general aſſault on the next, abandoned the place in the night. Thoſe who defended Red Bank followed their example, and abandoned it on the approach of Lord Cornwallis. A great number of the American ſhipping now finding themſelves entirely deſtitute of any protection, ſailed up the river in the night-time. Seventeen, however, remained, whoſe retreat was intercepted by a frigate and ſome armed veſſels; on which the Americans ran them aſhore and burnt them, to prevent their falling into the enemy's hands.

275 The Britiſh ſhips of war burnt.

276 All the forts near Philadelphia reduced.

Thus the campaign of 1777 in Penſylvania concluded ſucceſsfully on the part of the Britiſh. In the north, however, matters wore a different aſpect. The expedition in that quarter had been projected by the Britiſh miniſtry as the moſt effectual method that could be taken to cruſh the colonies at once. The four provinces of New England had originally begun the confederacy againſt Britain, and were ſtill conſidered as the moſt active in the continuation of it; and it was thought, that any impreſſion made upon them would contribute in an effectual manner to the reduction of all the reſt. For this purpoſe, an army of 4000 choſen Britiſh troops and 3000 Germans were put under the command of General Burgoyne; General Carleton was directed to uſe his intereſt with the Indians to perſuade them to join in this expedition; and the province of Quebec was to furniſh large parties to join in the ſame. The officers who commanded under General Burgoyne were General Philips of the artillery, Generals Fraſer, Powell, and Hamilton, with the German officers Generals Reideſel and Speecht. The ſoldiers, as has already been obſerved, were all excellently diſciplined, and had been kept in their winter-quarters with all imaginable care, in order to prepare them for the expedition on which they were going. To aid the principal expedition, another was projected on the Mohawk River under Colonel St Leger, who was to be aſſiſted by Sir John Johnſon, ſon to the famous Sir William Johnſon who had ſo greatly diſtinguiſhed himſelf in the war of 1755.

America. 277 Expedition projected againſt New England.

On the 21ſt of June 1777, the army encamped on the weſtern ſide of the Lake Champlain; where being joined by a conſiderable body of Indians, General Burgoyne made a ſpeech, in which he exhorted theſe new allies to lay aſide their ferocious and barbarous manner of making war; to kill only ſuch as oppoſed them in arms; and to ſpare priſoners, with ſuch women and children as ſhould fall into their hands. After iſſuing a proclamation, in which the force of Britain and that which he commanded was ſet forth in very oſtentatious terms, the campaign opened with the ſiege of Ticonderoga. The place was very ſtrong, and garriſoned by 6000 men under General Sinclair; nevertheleſs, the works were ſo extenſive, that even this number was ſcarce ſufficient to defend them properly. They had therefore omitted to fortify a rugged eminence called *Sugar Hill*, the top of which overlooked and effectually commanded the whole works; vainly imagining that the difficulty of the aſcent would be ſufficient to prevent the enemy from taking poſſeſſion of it. On the approach of the firſt diviſion of the army, the provincials abandoned and ſet fire to their outworks; and ſo expeditious were the Britiſh troops, that by the 5th of July every poſt was ſecured which was judged neceſſary for inveſting it completely. A road was ſoon after made to the very ſummit of that eminence which the Americans had with ſuch confidence ſuppoſed could not be aſcended; and ſo much were they now diſheartened, that they inſtantly abandoned the fort entirely, taking the road to Skeneſborough, a place to the ſouth of Lake George; while their baggage, with what artillery and military ſtores they could carry off, were ſent to the ſame place by water. But the Britiſh generals were determined not to let them paſs ſo eaſily. Both were purſued and both overtaken. Their armed veſſels conſiſted only of five galleys; two of which were taken, and three blown up; on which they ſet fire to their

278 General Burgoyne joined by the Indians.

279 Ticonderoga beſieged and taken.

280 Americans defeated by land and water.

their boats and fortifications at Skeneſborough. On this occaſion the provincials loſt 200 boats, 130 pieces of cannon, with all their proviſions and baggage. Their land-forces under Colonel Francis made a brave defence againſt General Fraſer; and being greatly ſuperior in number, had almoſt overpowered him, when General Reideſel with a large body of Germans came to his aſſiſtance. The enemy were now overpowered in their turn; and their commander being killed, they fled on all ſides with great precipitation. In this action 200 Americans were killed, as many taken priſoners, and above 600 wounded, many of whom periſhed in the woods for want of aſſiſtance.

During the engagement General Sinclair was at Caſtleton, about ſix miles from the place; but inſtead of going forward to Fort Anne, the next place of ſtrength, he repaired to the woods which lie between that fortreſs and New England. General Burgoyne, however, detached Colonel Hill with the ninth regiment, in order to intercept ſuch as ſhould attempt to retreat towards Fort Anne. On his way he met with a body of the enemy, ſaid to be ſix times as numerous as his own; but after an engagement of three hours, they were obliged to retire with great loſs. After ſo many diſaſters, deſpairing of being able to make any ſtand at Fort Anne, they ſet fire to it and retired to Fort Edward. In all theſe engagements the loſs of killed and wounded in the royal army did not exceed 200 men.

281 They are again defeated, and abandon Fort Anne.

282 General Burgoyne makes his way to Fort Edward with great difficulty.

General Burgoyne was now obliged to ſuſpend his operations for ſome time, and wait at Skeneſborough for the arrival of his tents, proviſions, &c. but employed this interval in making roads through the country about St Anne, and in clearing a paſſage for his troops to proceed againſt the enemy. This was attended with incredible toil; but all obſtacles were ſurmounted with equal patience and reſolution by the army. In ſhort, after undergoing the utmoſt difficulty that could be undergone, and making every exertion that man could make, he arrived with his army before Fort Edward about the end of July. Here General Schuyler had been for ſome time endeavouring to recruit the ſhattered American forces, and had been joined by General Sinclair with the remains of his army; the garriſon of Fort George alſo, ſituated on the lake of that name, had evacuated the place and retired to Fort Edward.

283 Americans retire to Saratoga.

But on the approach of the royal army, they retired from thence alſo, and formed their head-quarters at Saratoga. Notwithſtanding the great ſucceſſes of the Britiſh general, they ſhowed not the leaſt diſpoſition to ſubmit, but ſeemed only to conſider how they might make the moſt effectual reſiſtance. For this purpoſe, the militia was every where raiſed and draughted to join the army at Saratoga; and ſuch numbers of volunteers were daily added, that they ſoon began to recover from the terror into which they had been thrown. That they might have a commander whoſe abilities could be relied on, General Arnold was appointed, who repaired to Saratoga with a conſiderable train of artillery; but receiving intelligence that Colonel St Leger was proceeding with great rapidity in his expedition on the Mohawk River, he removed to Still-water, a place about half-way between Saratoga and the junction of the Mohawk and Hudſon's River. The Colonel, in the mean time, had advanced as far as Fort Stanwix; the ſiege of which he preſſed with great vigour. On the 6th of Auguſt, underſtanding that a ſupply of proviſions, eſcorted by 800 or 900 men, was on the way to the fort, he diſpatched Sir John Johnſon with a ſtrong detachment to intercept it. This he did ſo effectually, that, beſides intercepting the proviſions, 400 of its guard were ſlain, 200 taken, and the reſt eſcaped with great difficulty. The garriſon, however, were not to be intimidated by this diſaſter, nor by the threats or repreſentations of the Colonel: on the contrary, they made ſeveral ſucceſsful ſallies under Colonel Willet, the ſecond in command; and this gentleman, in company with another, even ventured out of the fort, and, eluding the vigilance of the enemy, paſſed through them in order to haſten the march of General Arnold to their aſſiſtance.

284 Fort Stanwix beſieged.

285 A detachment of Americans cut in pieces.

286 The Indians deſert, and force the colonel to raiſe the ſiege.

Thus the affairs of Colonel St Leger ſeemed to be in no very favourable ſituation notwithſtanding his late ſucceſs, and they were ſoon totally ruined by the deſertion of the Indians. They had been alarmed by the report of General Arnold's advancing with 2000 men to the relief of the fort; and while the Colonel was attempting to give them encouragement, another report was ſpread, that General Burgoyne had been defeated with great ſlaughter, and was now flying before the provincials. On this he was obliged to do as they thought proper; and the retreat could not be effected without the loſs of the tents and ſome of the artillery and military ſtores.

287 General Burgoyne diſtreſſed for want of proviſions.

General Burgoyne, in the mean time, notwithſtanding all the difficulties he had already ſuſtained, found that he muſt ſtill encounter more. The roads he had made with ſo much labour and pains were deſtroyed either by the wetneſs of the ſeaſon or by the enemy; ſo that the proviſions he brought from Fort George could not arrive at his camp without the moſt prodigious toil. On hearing of the ſiege of Fort Stanwix by Colonel St Leger, he determined to move forward, in hopes of incloſing the enemy betwixt his own army and that of St Leger, or of obtaining the command of all the country between Fort Stanwix and Albany; or at any rate, a junction with Colonel St Leger would be effected, which could not but be attended with the moſt happy conſequences. The only difficulty was the want of proviſions; and this it was propoſed to remedy by reducing the provincial magazines at Bennington. For this purpoſe, Colonel Baum, a German officer of great bravery, was choſen with a body of 500 men. The place was about 20 miles from Hudſon's River; and to ſupport Colonel Baum's party, the whole army marched up the river's bank, and encamped almoſt oppoſite to Saratoga, with the river betwixt it and that place. An advanced party was poſted at Batten Kill, between the camp and Bennington, in order to ſupport Colonel Baum. In their way the Britiſh ſeized a large ſupply of cattle and proviſions, which were immediately ſent to the camp; but the badneſs of the roads retarded their march ſo much, that intelligence of their deſign was ſent to Bennington. Underſtanding now that the American force was greatly ſuperior to his own, the Colonel acquainted the General, who immediately diſpatched Colonel Breyman with a party to his aſſiſtance; but through the ſame cauſes that had retarded the march of Colonel Baum, this aſſiſt-

288 Makes an attempt on the provincial magazines at Bennington.

America.

289 Colonel Baum utterly defeated and taken priſoner.

290 Colonel Breyman defeated.

aſſiſtance could not arrive in time. General Starke, in the mean time, who commanded at Bennington, determined to attack the two parties ſeparately; and for this purpoſe advanced againſt Colonel Baum, whom he ſurrounded on all ſides and attacked with the utmoſt violence. The troops defended themſelves with great valour, but were to a man either killed or taken. Colonel Breyman, after a deſperate engagement, had the good luck to effect a retreat through the darkneſs of the night, which otherwiſe he could not have done, as his men had expended all their ammunition, being 40 rounds to each.

291 The Americans attack the Royal army,

292 And are with great difficulty repulſed.

293 The Indians deſert.

294 A letter from Sir Henry Clinton, with General Burgoyne's anſwer.

General Burgoyne, thus diſappointed in his attempt on Bennington, applied himſelf with indefatigable diligence to procure proviſions from Fort George; and having at length amaſſed a ſufficient quantity to laſt for a month, he threw a bridge of boats over the river Hudſon, which he croſſed about the middle of September, encamping on the hills and plains near Saratoga. As ſoon as he approached the provincial army, at this time encamped at Stillwater under General Gates, he determined to make an attack; for which purpoſe he put himſelf at the head of the central diviſion of his army, having General Fraſer and Colonel Breyman on the right, with Generals Reideſel and Philips on the left. In this poſition he advanced towards the enemy on the 19th of September. But the Americans did not now wait to be attacked: on the contrary, they attacked the central diviſion with the utmoſt violence; and it was not until General Philips with the artillery came up that they could be repulſed. On this occaſion, though the Britiſh troops loſt only 330 in killed and wounded, and the enemy no fewer than 1500, the former were very much alarmed at the obſtinate reſolution ſhown by the Americans. This did not, however, prevent them from advancing towards the enemy, and poſting themſelves the next day within cannon-ſhot of their lines. But their allies the Indians began to deſert in great numbers; and at the ſame time the general was in the higheſt degree mortified by having no intelligence of any aſſiſtance from Sir Henry Clinton, as had been ſtipulated. He now received a letter from him, by which he was informed that Sir Henry intended to make a diverſion on the North River in his favour. This afforded but little comfort: however, he returned an anſwer by ſeveral truſty perſons whom he diſpatched different ways, ſtating his preſent diſtreſſed ſituation, and mentioning that the proviſions and other neceſſaries he had would only enable him to hold out till the 12th of October.

295 Expedition of the provincials againſt Ticonderoga.

296 They make a deſperate attack on the royal army.

297 Kill General Fraſer,

298 And defeat the Germans with great ſlaughter.

In the mean time the Americans, in order to cut off the retreat of the Britiſh army in the moſt effectual manner, undertook an expedition againſt Ticonderoga; but were obliged to abandon the enterpriſe after having ſurpriſed all the out-poſts, and taken a great number of boats with ſome armed veſſels, and a number of priſoners. The army under general Burgoyne, however, continued to labour under the greateſt diſtreſſes; ſo that in the beginning of October he had been obliged to diminiſh the ſoldiers allowance. On the 7th of that month he determined to move towards the enemy. For this purpoſe he ſent a body of 1500 men to reconnoitre their left wing; intending, if poſſible, to break through it in order to effect a retreat. The detachment, however, had not proceeded far when a dreadful attack was made upon the left wing of the Britiſh army, which was with great difficulty preſerved from being entirely broken by a reinforcement brought up by general Fraſer, who was killed in the attack. After the troops had with the moſt deſperate efforts regained their camp, it was moſt furiouſly aſſaulted by general Arnold; who, notwithſtanding all oppoſition, would have forced the entrenchments, had he not received a dangerous wound, which obliged him to retire. Thus the attack failed on the left, but on the right the camp of the German reſerve was forced, Colonel Breyman killed, and his countrymen defeated with great ſlaughter and the loſs of all their artillery and baggage.

299 The royal army in danger of being ſurrounded.

300 Attempt a retreat without ſucceſs.

This was by far the heavieſt loſs the Britiſh army had ſuſtained ſince the action at Bunker's Hill. The liſt of killed and wounded amounted to near 1200, excluſive of the Germans; but the greateſt misfortune was, that the enemy had now an opening on the right and rear of the Britiſh forces, ſo that the army was threatened with entire deſtruction. This obliged General Burgoyne once more to ſhift his poſition, that the enemy might alſo be obliged to alter theirs. This was accompliſhed on the night of the 7th, without any loſs, and all the next day he continued to offer the enemy battle; but they were now too well aſſured of obtaining a complete victory, by cutting off all ſupplies from the Britiſh, to riſk a pitched battle. Wherefore they advanced on the right ſide, in order to incloſe him entirely; which obliged the General to direct a retreat towards Saratoga. But the enemy had now ſtationed a great force on the ford at Hudſon's river, ſo that the only poſſibility of retreat was by ſecuring a paſſage to Lake George; and to effect this, a body of workmen were detached, with a ſtrong guard, to repair the roads and bridges that led to Fort Edward. As ſoon as they were gone, however, the enemy ſeemed to prepare for an attack; which rendered it neceſſary to recal the guard, and the workmen being of courſe left expoſed could not proceed.

In the mean time, the boats which conveyed proviſions down Hudſon's river were expoſed to the continual fire of the American markſmen, who took many of them; ſo that it became neceſſary to convey the proviſions over land. In this extreme danger, it was reſolved to march by night to Fort Edward, forcing the paſſages at the fords either above or below the place; and in order to effect this the more eaſily, it was reſolved that the ſoldiers ſhould carry their proviſions on their backs, leaving behind their baggage and every other incumbrance. But before this could be executed, intelligence was received that the enemy had raiſed ſtrong entrenchments oppoſite to theſe fords, well provided with cannon, and that they had likewiſe taken poſſeſſion of the riſing ground between Fort George and Fort Edward, which in like manner was provided with cannon.

301 Diſtreſſed ſituation of the royal army.

All this time the American army was increaſing by the continual arrival of militia and volunteers from all parts. Their parties extended all along the oppoſite bank of Hudſon's River, and ſome had even paſſed it in order to obſerve the leaſt movement of the Britiſh army. The whole force under General Gates was computed at 16,000 men, while the army under General Burgoyne ſcarce amounted to 6000; and every part of the

the camp was reached by the grape and rifle-ſhot of the enemy, beſides a diſcharge from their artillery, which was almoſt inceſſant. In this ſtate of extreme diſtreſs and danger, the army continued with the greateſt conſtancy and perſeverance till the evening of the 13th of October, when an inventory of proviſions being taken, it was found that no more remained than what were

302 It is obliged to capitulate.

ſufficient to ſerve for three days; and a council of war being called, it was unanimouſly determined that there was no method now remaining but to treat with the enemy. In conſequence of this, a negociation was opened next day, which ſpeedily terminated in a capitulation of the whole Britiſh army; the principal article of which was, that the troops were to have a free paſſage to Britain, on condition of not ſerving againſt America during the war. On this occaſion, General Gates ordered his army to keep within their camp while the Britiſh ſoldiers went to a place appointed for them to lay down their arms, that the latter might not have the additional mortification of being made ſpectacles of ſo melancholy an event. The number of thoſe who ſurrendered at Saratoga amounted to 5750, according to the American accounts; the liſt of ſick and wounded left in the camp when the army retreated to Saratoga, to 528; and the number of thoſe loſt by other accidents ſince the taking of Ticonderoga, to near 3000. Thirty-five braſs field-pieces, 7000 ſtand of arms, clothing for an equal number of ſoldiers, with the tents, military-cheſt, &c. conſtituted the booty on this occaſion.

303 Succeſsful expedition of Sir Henry Clinton.

Sir Henry Clinton, in the mean time, had ſailed up the North River, and deſtroyed the two forts called Montgomery and Clinton, with Fort Conſtitution, and another place called Continental Village, where were barracks for 2000 men. Seventy large cannon were carried away, beſides a number of ſmaller artillery, and a great quantity of ſtores and ammunition; a large boom and chain reaching acroſs the river from Fort Montgomery to a point of land called St Anthony's Noſe, and which coſt not leſs than L. 70,000 Sterling, were partly deſtroyed and partly carried away, as was alſo another boom of little leſs value at Fort Conſtitution. The loſs of the Britiſh army was but ſmall in number, though ſome officers of great merit were killed in the different attacks.

Another attack was made by Sir James Wallace with ſome frigates, and a body of land forces under General Vaughan. The place which now ſuffered was named Eſopus: the fortifications were deſtroyed, and the town itſelf was reduced to aſhes, as that called Continental Village had been before.

But theſe ſucceſſes, of whatever importance they might be, were now diſregarded by both parties. They

304 Great dejection on account of Burgoyne's capture.

ſerved only to irritate the Americans, fluſhed with their ſucceſs; and they were utterly inſufficient to raiſe the ſpirits of the Britiſh, who were now thrown into the utmoſt diſmay.

On the 16th of March 1778, Lord North intimated to the houſe of commons, that a paper had been laid

305 Treaty between France and America.

before the king by the French ambaſſador, intimating the concluſion of an alliance between the court of France and the United States of America. The preliminaries of this treaty had been concluded in the end of the year 1777, and a copy of them ſent to congreſs, in order to counteract any propoſals that might be made in the mean time by the Britiſh miniſtry. On the 6th of February 1778, the articles were formally ſigned, to the great ſatisfaction of the French nation. They were in ſubſtance as follows:

1. If Great Britain ſhould, in conſequence of this treaty, proceed to hoſtilities againſt France, the two nations ſhould mutually aſſiſt one another.

2. The main end of the treaty was in an effectual manner to maintain the independency of America.

3. Should thoſe places of North America ſtill ſubject to Britain be reduced by the colonies, they ſhould be confederated with them, or ſubjected to their juriſdiction.

4. Should any of the Weſt India iſlands be reduced by France, they ſhould be deemed its property.

5. No formal treaty with Great Britain ſhould be concluded either by France or America without the conſent of each other; and it was mutually engaged that they ſhould not lay down their arms till the independence of the States had been formally acknowledged.

6. The contracting parties mutually agreed to invite thoſe powers that had received injuries from Great Britain to join the common cauſe.

7. The United States guaranteed to France all the poſſeſſions in the Weſt Indies which ſhe ſhould conquer; and France in her turn guaranteed the abſolute independency of the States, and their ſupreme authority over every country they poſſeſſed, or might acquire during the war.

The notification of ſuch a treaty as this could not but be looked upon as a declaration of war. On its

306 Debates occaſioned by the treaty.

being announced to the houſe, every one agreed in an addreſs to his majeſty, promiſing to ſtand by him to the utmoſt in the preſent emergency; but it was warmly contended by the members in oppoſition, that the preſent miniſtry ought to be removed on account of their numberleſs blunders and miſcarriages in every inſtance. Many were of opinion, that the only way to extricate the nation from its trouble was to acknowledge the independency of America at once; and thus we might ſtill do with a good grace what muſt inevitably be done at laſt, after expending much more blood and treaſure than had yet been laviſhed in this unhappy conteſt. The miniſterial party, however, entertained different ideas. Inſtigated by zeal for the national honour, it was determined at once to reſent the arrogance of France, and proſecute hoſtilities againſt America with more vigour than ever, ſhould the terms now offered them be rejected.

307 Americans ſend agents to different courts.

The Americans, in the mean time, aſſiduouſly employed their agents at the courts of Spain, Vienna, Pruſſia, and Tuſcany, in order, if poſſible, to conclude alliances with them, or at leaſt to procure an acknowledgment of their independency. As it had been reported that Britain intended to apply for aſſiſtance to Ruſſia, the American commiſſioners were enjoined to uſe their utmoſt influence with the German princes to prevent ſuch auxiliaries from marching through their territories, and to endeavour to procure the recal of the German troops already ſent to America. To France they offered a ceſſion of ſuch Weſt India iſlands as ſhould be taken by the united ſtrength of France and America; and ſhould Britain by their joint endeavours be diſpoſſeſſed of Newfoundland, Cape Breton, and Nova

America. Nova Scotia, theſe territories ſhould be divided betwixt the two nations, and Great Britain be totally excluded from the fiſhery. The propoſals to the Spaniſh court were, that in caſe they ſhould think proper to eſpouſe their quarrel, the American States ſhould aſſiſt in reducing Penſacola under the dominion of Spain, provided their ſubjects were allowed the free navigation of the river Miſſiſippi, and the uſe of the harbour of Penſacola; and they further offered, that if agreeable to Spain, they would declare war againſt Portugal, ſhould that power expel the American ſhips from its ports.

308 General Burgoyne's troops detained in America.

In the mean time, the troops under General Burgoyne were preparing to embark for Britain according to the convention at Saratoga; but to their utter ſurpriſe, congreſs poſitively refuſed to allow them to embark, under pretence that ſome ſiniſter deſigns were harboured on the part of Britain, and that they only wanted an opportunity to join the other troops at Philadelphia or New York.

309 Predatory war carried on by the Britiſh troops.

The ſeaſon for action was now approaching; and congreſs was indefatigable in its preparations for a new campaign, which it was confidently ſaid would be the laſt. Among other methods taken for this purpoſe, it was recommended to all the young gentlemen of the colonies to form themſelves into bodies of cavalry to ſerve at their own expence during the war. General Waſhington at the ſame time, in order to remove all incumbrances from his army, lightened the baggage as much as poſſible, by ſubſtituting ſacks and portmanteaus in place of cheſts and boxes, and uſing pack-horſes inſtead of waggons.

310 Conciliatory bill received with indignation by the army.

On the other hand, the Britiſh army, expecting to be ſpeedily reinforced by 20,000 men, thought of nothing but concluding the war according to their wiſhes before the end of the campaign. It was with the utmoſt concern, as well as indignation, therefore, that they received the news of Lord North's conciliatory bill. It was univerſally looked upon as a national diſgrace; and ſome even tore the cockades from their hats, and trampled them under their feet as a token of their indignation.

311 Deſpiſed by the coloniſts.

By the coloniſts it was received with indifference. The Britiſh commiſſioners endeavoured to make it as public as poſſible; and the congreſs, as formerly, ordered it to be printed in all the newſpapers. On this occaſion Governor Tryon incloſed ſeveral copies of the bill to General Waſhington in a letter, intreating that he would allow them to be circulated; to which that general returned for anſwer a copy of a newſpaper in which the bill was printed, with the reſolutions of congreſs upon it. Theſe were, That whoever preſumed to make a ſeparate agreement with Britain ſhould be deemed a public enemy; that the United States could not with any propriety keep correſpondence with the commiſſioners until their independence was acknowledged, and the Britiſh fleets and armies removed from America. At the ſame time, the colonies were warned not to ſuffer themſelves to be deceived into ſecurity by any offers that might be made; but to uſe their utmoſt endeavours to ſend their quotas with all diligence into the field. The individuals with whom the commiſſioners converſed on the ſubject of the conciliatory bill, generally returned for anſwer, that the day of reconciliation was paſt; and that the haughtineſs of Britain had extinguiſhed all filial regard in the breaſts of the Americans.

About this time alſo Mr Silas Deane arrived from France with two copies of the treaty of commerce and alliance to be ſigned by congreſs. Advices of the moſt agreeable nature were alſo received from various parts, repreſenting in the moſt favourable light the diſpoſitions of the European powers; all of whom, it was ſaid, wiſhed to ſee the independence of America ſetled upon the moſt firm and permanent baſis. America.

312 Bad ſucceſs of the commiſſioners.

Conſidering the ſituation of matters with the coloniſts at this time, therefore, it is no wonder that the commiſſioners found themſelves unable to accompliſh the errand on which they came. Their propoſals were utterly rejected, themſelves treated as ſpies, and all intercourſe with them interdicted.

313 Philadelphia evacuated.

But before any final anſwer could be obtained from congreſs, Sir Henry Clinton had taken the reſolution of evacuating Philadelphia. Accordingly, on the 10th of June, after having made all neceſſary preparations, the army marched out of the city and croſſed the Delaware before noon with all its baggage and other incumbrances. General Waſhington, appriſed of this deſign, had diſpatched expreſſes into the Jerſeys with orders to collect all the force that could be aſſembled in order to obſtruct the march of the enemy. After various movements on both ſides, Sir Henry Clinton, with the royal army, arrived on the 27th of June at a place called Freehold; where, judging that the enemy would attack him, he encamped in a very ſtrong ſituation. Here General Waſhington determined to make an attack as ſoon as the army had again begun its march. The night was ſpent in making the neceſſary preparations, and General Lee with his diviſion was ordered to be ready by daybreak. But Sir Henry Clinton, juſtly apprehending that the chief object of the enemy was the baggage, committed it to the care of General Knyphauſen, whom he ordered to ſet out early in the morning, while he followed with the reſt of the army. The attack was accordingly made; but the Britiſh general had taken ſuch care to arrange his troops properly, and ſo effectually ſupported his forces when engaged with the Americans, that the latter not only made no impreſſion, but were with difficulty preſerved from a total defeat by the advance of General Waſhington with the whole army. The Britiſh troops effected their retreat with the loſs of 300 men, of whom many died through mere fatigue, without any wound. In this action General Lee was charged by General Waſhington with diſobedience and miſconduct in retreating before the Britiſh army. He was tried by a court-martial, and ſentenced to a temporary ſuſpenſion from his command. After they had arrived at Sandy Hook, a bridge of boats was by Lord Howe's directions thrown from thence over the channel which ſeparated the iſland from the main land, and the troops were conveyed aboard the fleet; after which they ſailed to New York. After ſending ſome light detachments to watch the enemy's motions, General Waſhington marched towards the North River, where a great force had been collected to join him, and where it was now expected that ſome very capital operations would take place.

In the mean time, France had ſet about her preparations for the aſſiſtance of the Americans. On the 14th of April Count d'Eſtaing had ſailed from Toulon

America. lon with a ftrong fquadron of fhips of the line and frigates, and arrived on the coaft of Virginia in the beginning of July, while the Britifh fleet was employed in conveying the forces from Sandy Hook to New York. It confifted of one fhip of 90 guns, one of 80, fix of 74, and four of 64, befides feveral large frigates; and, exclufive of its complement of failors, had 6000 marines and foldiers on board. To oppofe this the Britifh had only fix fhips of 64 guns, three of 50, and two of 40, with fome frigates and floops. Notwithftanding this inferiority, however, the Britifh admiral pofted himfelf fo advantageoufly, and fhowed fuch fuperior fkill, that d'Eftaing did not think proper to attack him. He therefore remained at anchor four miles off Sandy Hook till the 22d of July, without effecting any thing more than the capture of fome veffels, which, through ignorance of his arrival, fell into his hands.

314 French fleet arrives in America.

315 Attempts Rhode Ifland without fuccefs.

The next attempt of the French admiral was, in conjunction with the Americans, on Rhode Ifland. It was propofed that d'Eftaing, with the 6000 troops he had with him, fhould make a defcent on the fouthern part of the ifland, while a body of the Americans fhould take poffeffion of the north; at the fame time the French fquadron was to enter the harbour of Newport, and take and deftroy all the Britifh fhipping. On the 8th of Auguft the French admiral entered the harbour as was propofed, but found himfelf unable to do any material damage. Lord Howe, however, inftantly fet fail for Rhode ifland; and d'Eftaing, confiding in his fuperiority, immediately came out of the harbour to attack him. A violent ftorm parted the two fleets, and did fo much damage that they were rendered totally unfit for action. The French, however, fuffered moft; and feveral of their fhips being afterwards attacked fingly by the Britifh, very narrowly efcaped being taken. On the 20th of Auguft he returned to Newport in a very fhattered condition; and, not thinking himfelf fafe there, failed two days after for Bofton. General Sullivan had landed in the mean time on the northern part of Rhode Ifland with 10,000 men. On the 17th of Auguft they began their operations by erecting batteries, and making their approaches to the Britifh lines. But General Pigot, who commanded in Newport, had taken fuch effectual care to fecure himfelf on the land-fide, that without the affiftance of a marine force it was altogether impoffible to attack him with any probability of fuccefs. The conduct of d'Eftaing, therefore, who had abandoned them when mafter of the harbour, gave the greateft difguft to the people of New England, and Sullivan began to think of a retreat. On perceiving his intentions, the garrifon fallied out upon him with fo much vigour, that it was not without difficulty that he effected his retreat. He had not been long gone when Sir Henry Clinton arrived with a body of 4000 men; which, had it arrived fooner, would have enabled the Britifh commander to have gained a decifive advantage over him, as well as to have deftroyed the town of Providence, which, by its vicinity to Rhode Ifland, and the enterprifes which were continually projected and carried on in that place, kept the inhabitants of Rhode Ifland in continual alarms.

The firft Britifh expedition was to Buzzard's Bay, on the coaft of New England and neighbourhood of Rhode Ifland. Here they deftroyed a great number of privateers and merchantmen, magazines, with ftorehoufes, &c.; whence proceeding to a fertile and populous ifland called Martha's Vineyard, they carried off 10,000 fheep and 300 black cattle. Another expedition took place up the North River, under Lord Cornwallis and General Knyphaufen; the principal event of which was the deftruction of a regiment of American cavalry known by the name of Wafhington's Light Horfe. A third expedition was directed to Little Egg Harbour in New Jerfey, a place noted for privateers, the deftruction of which was its principal intention. It was conducted by Captains Fergufon and Collins, and ended in the deftruction of the enemy's veffels, as well as of the place itfelf. At the fame time part of another body of American troops, called Pulafki's Legion, was furprifed, and a great number of them put to the fword.

America. 316 The coafts of America invaded by the Britifh fleet.

317 Expedition againft Georgia.

The Americans had in the beginning of the year projected the conqueft of Weft Florida; and one Captain Willing, with a party of refolute men, had made a fuccefsful incurfion into the country. This awakened the attention of the Britifh to the fouthern colonies, and an expedition againft them was refolved on. Georgia was the place of deftination; and the more effectually to enfure fuccefs, Colonel Campbell, with a fufficient force, under convoy of fome fhips of war, commanded by Commodore Hyde Parker, embarked at New York, while General Prevoft, who commanded in Eaft Florida, was directed to fet out with all the force he could fpare. The armament from New York arrived off the coaft of Georgia in the month of December; and though the enemy were very ftrongly pofted in an advantageous fituation on the fhore, the Britifh troops made good their landing, and advanced towards Savannah the capital of the province. That very day they defeated the force of the provincials which oppofed them; and took poffeffion of the town with fuch celerity, that the Americans had not time to execute a refolution they had taken of fetting it on fire. In ten days the whole province of Georgia was reduced, Sunbury alone excepted; and this was alfo brought under fubjection by General Prevoft in his march northward. Every proper method was taken to fecure the tranquillity of the country; and rewards were offered for apprehending committee and affembly men, or fuch as they judged moft inimical to the Britifh interefts. On the arrival of General Prevoft, the command of the troops naturally devolved on him as the fenior officer; and the conqueft of Carolina was next projected.

318 Take poffeffion of Georgia.

319 Carolina invaded.

In this attempt there was no fmall probability of fuccefs. The country contained a great number of friends to government, who now eagerly embraced the opportunity of declaring themfelves; many of the inhabitants of Georgia had joined the royal ftandard; and there was not in the province any confiderable body of provincial forces capable of oppofing the efforts of regular and well-difciplined troops. On the firft news of General Prevoft's approach, the loyalifts affembled in a body, imagining themfelves able to ftand their ground until their allies fhould arrive; but in this they were difappointed. The Americans attacked and defeated them with the lofs of half their number. The remainder retreated into Georgia; and after undergoing

America.

dergoing many difficulties, at laſt effected a junction with the Britiſh forces.

In the mean time, General Lincoln, with a conſiderable body of American troops, had encamped within 20 miles of the town of Savannah; and another ſtrong party had poſted themſelves at a place called *Briar's Creek*, farther up the river of the ſame name. Thus the extent of the Britiſh government was likely to be circumſcribed within very narrow bounds. General Prevoſt therefore determined to diſlodge the party at Briar's Creek: and the latter, truſting to their ſtrong ſituation, and being remiſs in their guard, ſuffered themſelves to be ſurpriſed on the 30th of March 1779; when they were utterly routed with the loſs of 400 killed and taken, beſides a great number drowned in the river or the ſwamps. The whole artillery, ſtores, baggage, and almoſt all the arms, of this unfortunate party were taken, ſo that they could no more make any ſtand; and thus the province of Georgia was once more freed from the enemy, and a communication opened with thoſe places in Carolina where the royaliſts chiefly reſided.

320 Americans defeated.

The victory at Briar's Creek proved of conſiderable ſervice to the Britiſh cauſe. Great numbers of the loyaliſts joined his army, and conſiderably increaſed its force. Hence he was enabled to ſtretch his poſts further up the river, and to guard all the principal paſſes: ſo that General Lincoln was reduced to a ſtate of inaction; and at laſt moved off towards Auguſta, in order to protect the provincial aſſembly, which was obliged to ſit in that place, the capital being now in the hands of the Britiſh.

Lincoln had no ſooner quitted his poſt, than it was judged a proper time by the Britiſh general to put in execution the grand ſcheme which had been meditated againſt Carolina. Many difficulties indeed lay in his way. The river Savannah was ſo ſwelled by the exceſſive rains of the ſeaſon, that it ſeemed impaſſable; the oppoſite ſhore, for a great way, was ſo full of ſwamps and marſhes, that no army could march over it without the greateſt difficulty; and, to render the paſſage ſtill more difficult, General Moultrie was left with a conſiderable body of troops in order to oppoſe the enemy's attempts. But in ſpite of every oppoſition, the conſtancy and perſeverance of the Britiſh forces at laſt prevailed. General Moultrie was defeated, and obliged to retire towards Charleſtown; and the victorious army, after having waded through the marſhes for ſome time, at laſt arrived in an open country, through which they purſued their march with great rapidity towards the capital; while General Lincoln remained in a ſtate of ſecurity at Auguſta, vainly imagining that the obſtacles he had left in the way could not be ſurmounted.

321 The Britiſh troops advance to Charleſtown.

Certain intelligence of the danger to which Charleſtown was expoſed, at laſt arrouſed the American general from his lethargy. A choſen body of infantry, mounted on horſeback for the greater expedition, was diſpatched before him; while Lincoln himſelf followed with all the forces he could collect. General Moultrie too, with the troops he had brought from the Savannah, and ſome others he had collected ſince his retreat from thence, had taken poſſeſſion of all the avenues leading to Charleſtown, and prepared for a vigorous defence. But all oppoſition proved ineffectual. The Americans were defeated in every encounter; and retreating continually, allowed the Britiſh army to come within cannon ſhot of Charleſtown on the 12th of May.

322 General Lincoln advances to its relief.

The town was now ſummoned to ſurrender, and the inhabitants would gladly have agreed to obſerve a neutrality during the reſt of the war, and would have engaged alſo for the reſt of the province. But theſe terms not being accepted, they made preparations for a vigorous defence. It was not, however, in the power of the Britiſh commander at this time to make an attack with any proſpect of ſucceſs. His artillery was not of ſufficient weight; there were no ſhips to ſupport his attack by land; and General Lincoln advancing rapidly with a ſuperior army, threatened to incloſe him between his own force and the town; ſo that ſhould he fail in his firſt attempt, certain deſtruction would be the conſequence. For theſe reaſons he withdrew his forces from before the town, and took poſſeſſion of two iſlands called *St James's* and *St John's*, lying to the ſouthward; where having waited ſome time, his force was augmented by the arrival of two frigates. With theſe he determined to make himſelf maſter of Port Royal, another iſland poſſeſſed of an excellent harbour and many other natural advantages, from its ſituation alſo commanding all the ſea-coaſt from Charleſtown to Savannah River. The American general, however, did not allow this to be accompliſhed without oppoſition. Perceiving that his opponent had occupied an advantageous poſt on St John's iſland preparatory to his enterpriſe againſt Port Royal, he attempted, on the 20th of June, to diſlodge him from it; but after an obſtinate attack, the provincials were, as uſual, obliged to retire with conſiderable loſs. On this occaſion the ſucceſs of the Britiſh arms was in a great meaſure owing to an armed float; which galled the right flank of the enemy ſo effectually, that they could direct their efforts only againſt the ſtrongeſt part of the lines, which proved impregnable to their attacks. This diſappointment was inſtanly followed by the loſs of Port Royal, which General Prevoſt took poſſeſſion of, and put his troops into proper ſtations, waiting for the arrival of ſuch reinforcements as were neceſſary for the intended attack on Charleſtown.

323 The attempt on it abandoned.

324 The Americans defeated.

In the mean time Count D'Eſtaing, who, as we have already obſerved, had put into Boſton harbour to refit, had uſed his utmoſt efforts to ingratiate himſelf with the inhabitants of that city. Zealous alſo in the cauſe of his maſter, he had publiſhed a proclamation to be diſperſed through Canada, inviting the people to return to their original friendſhip with France, and declaring that all who renounced their allegiance to Great Britain ſhould certainly find a protector in the king of France. All his endeavours, however, proved inſufficient at this time to produce any revolution, or even to form a party of any conſequence among the Canadians.

325 D'Eſtaing's proclamation.

As ſoon as the French admiral had refitted his fleet, he took the opportunity, while that of Admiral Byron had been ſhattered by a ſtorm, of ſailing to the Weſt-Indies. During his operations there, the Americans having repreſented his conduct as totally unſerviceable to them, he received orders from Europe to aſſiſt the colonies with all poſſible ſpeed.

326 D'Eſtaing ſails to the Weſt Indies.

In compliance with theſe orders, he directed his courſe towards Georgia, with a deſign to recover that

America. province out of the hands of the enemy, and to put it, as well as South Carolina, in such a posture of defence as would effectually secure them from any future attack. This seemed to be an easy matter, from the little force with which he knew he should be opposed; and the next object in contemplation was no less than the destruction of the British fleet and army at New York, and their total expulsion from the continent of America. Full of these hopes, the French commander arrived off the coast of Georgia with a fleet of 22 sail of the line and 10 large frigates. His arrival was so little expected, that several vessels laden with provisions and military stores fell into his hands; the Experiment also, a vessel of 50 guns, commanded by Sir James Wallace, was taken after a stout resistance. On the continent, the British troops were divided. General Prevost, with an inconsiderable part, remained at Savannah; but the main force was under Colonel Maitland at Port Royal. On the first appearance of the French fleet, an express was dispatched to Colonel Maitland: but it was intercepted by the enemy; so that before he could set out in order to join the commander in chief, the Americans had secured most of the passes by land, while the French fleet effectually blocked up the passage by sea. But, by taking advantage of creeks and inlets, and marching over land, he arrived just in time to relieve Savannah.

327 D'Estaing's expedition against Georgia.

328 Absurd conduct of the French commander.

D'Estaing, after making a gasconade of what had happened at St Vincents and Grenada, had allowed General Prevost 24 hours to deliberate whether he should capitulate or not. This time the general employed in making the best preparations he could for a defence; and during this time it was that Colonel Maitland arrived. D'Estaing's summons was now rejected; and as on this occasion the superiority of the enemy was by no means so much out of proportion as it had been at Grenada, there was every probability of success on the part of the British. The garrison now consisted of 3000 men, all of approved valour and experience, while the united force of the French and Americans did not amount to 10,000. The event was answerable to the expectations of the British general. Having the advantage of a strong fortification and excellent engineers, the fire of the allies made so little impression, that D'Estaing resolved to bombard the town, and a battery of nine mortars was erected for the purpose. This produced a request from General Prevost, that the women and children might be allowed to retire to a place of safety. But the allied commanders had the inhumanity to refuse compliance; and they resolved to give a general assault. This was accordingly attempted on the 9th of October: but the assailants were every where repulsed with such slaughter, that 1200 were killed and wounded; among the former were Count Polaski, and among the latter was D'Estaing himself.

329 Cruelty of the French and American generals.

330 They are utterly defeated.

This disaster entirely overthrew the sanguine hopes of the Americans and French; mutual reproaches and animosities took place in the most violent degree; and after waiting eight days longer, both parties prepared for a retreat; the French to their shipping, and the Americans into Carolina.

While the allies were thus unsuccessfully employed in the Southern colonies, their antagonists were no less assiduous in distressing them in the northern parts. Sir George Collier was sent with a fleet, carrying on board General Matthews, with a body of land forces, into the province of Virginia. Their first attempt was on the town of Portsmouth; where, though the enemy had destroyed some ships of great value, the British troops arrived in time to save a great number of others. On this occasion about 120 vessels of different sizes were burnt, and 20 carried off; and an immense quantity of provisions designed for the use of General Washington's army was either destroyed or carried off, together with a great variety of naval and military stores. The fleet and army returned with little or no loss to New York.

America. 331 Successful expeditions against the northern American provinces.

The success with which this expedition was attended, soon gave encouragement to attempt another. The Americans had for some time been employed in the erection of two strong forts on the river; the one at Verplanks Neck on the east, and the other at Stoney Point on the west side. These when completed would have been of the utmost service to the Americans, as commanding the principle pass, called the *King's Ferry*, between the northern and southern colonies. At present, however, they were not in a condition to make any effectual defence; and it was therefore determined to attack them before the works should be completed. The force employed on this occasion was divided into two bodies; one of which directed its course against Verplanks, and the other against Stoney Point. The former was commanded by General Vaughan, the latter by General Pattison, while the shipping was under the direction of Sir George Collier. General Vaughan met with no resistance, the enemy abandoning their works, and setting fire to every thing combustible that they could not carry off. At Stoney Point, however, a vigorous defence was made, though the garrison was at last obliged to capitulate upon honourable conditions. To secure the possession of this last, which was the more important of the two, General Clinton removed from his former situation, and encamped in such a manner that Washington could not give any assistance. The Americans, however, revenged themselves by distressing, with their numerous privateers, the trade to New York.

This occasioned a third expedition to Connecticut, where these privateers were chiefly built and harboured. The command was given to Governor Tryon and to General Garth, an officer of known valour and experience. Under convoy of a considerable number of armed vessels they landed at Newhaven, where they demolished the batteries that had been erected to oppose them, and destroyed the shipping and naval stores; but they spared the town itself, as the inhabitants had abstained from firing out of their houses upon the troops. From Newhaven they marched to Fairfield, where they proceeded as before, reducing the town also to ashes. Norwalk was next attacked, which in like manner was reduced to ashes; as was also Greenfield, a small seaport in the neighbourhood.

These successes proved very alarming as well as detrimental to the Americans; so that General Washington determined at all events to drive the enemy from Stoney Point. For this purpose he sent Gen. Wayne with a detachment of chosen men, directing them to attempt the recovery of it by surprise. On this occasion the Americans showed a spirit and resolution exceeding

America. ceeding any thing they had performed during the courſe of the war. Though after the capture of it by the Britiſh the fortifications of this place had been completed, and were very ſtrong, they attacked the enemy with bayonets, after paſſing through a heavy fire of muſquetry and grape ſhot; and in ſpite of all oppoſition, obliged the ſurviving part of the garriſon, amounting to 500 men, to ſurrender themſelves priſoners of war.

Though the Americans did not at preſent attempt to retain poſſeſſion of Stoney Point, the ſucceſs they had met with in the enterpriſe emboldened them to make a ſimilar attempt on Paulus Hook, a fortified poſt on the Jerſey ſide oppoſite to New York; but in this they were not attended with equal ſucceſs, being obliged to retire with precipitation after they had made themſelves maſters of one or two poſts.

332 Unſucceſsful expedition of the Americans againſt Penobſcot. Another expedition of greater importance was now projected on the part of the Americans. This was againſt a poſt on the river Penobſcot, on the borders of Nova Scotia, of which the Britiſh had lately taken poſſeſſion, and where they had begun to erect a fort which threatened to be a very great inconvenience to the coloniſts. The armament deſtined againſt it was ſo ſoon got in readineſs, that Colonel Maclane, the commanding officer at Penobſcot, found himſelf obliged to drop the execution of part of his ſcheme; and inſtead of a regular fort, to content himſelf with putting the works already conſtructed in as good a poſture of defence as poſſible. The Americans could not effect a landing without a great deal of difficulty, and bringing the guns of their largeſt veſſels to bear upon the ſhore. As ſoon as this was done, however, they erected ſeveral batteries, and kept up a briſk fire for the ſpace of a fortnight; after which they propoſed to give a general aſſault: but before this could be effected, they perceived Sir George Collier with a Britiſh fleet ſailing up the river to attack them. On this they inſtantly embarked their artillery and military ſtores, ſailing up the river as far as poſſible in order to avoid him. They were ſo cloſely purſued, however, that not a ſingle veſſel could eſcape; ſo that the whole fleet, conſiſting of 19 armed veſſels and 24 tranſports, was deſtroyed; moſt of them indeed being blown up by themſelves. The ſoldiers and ſailors were obliged to wander through immenſe deſerts, where they ſuffered much for want of proviſions; and to add to their calamities, a quarrel broke out between the ſoldiers and ſeamen concerning the cauſe of their diſaſter, which ended in a violent fray, wherein a great number were killed.

Thus the arms of America and France being almoſt every where unſucceſsful, the independency of the former ſeemed yet to be in danger notwithſtanding the aſſiſtance of ſo powerful an ally, when further encou-

333 Spain joins the confederacy againſt Britain. ragement was given by the acceſſion of Spain to the confederacy againſt Britain in the month of June 1779. The firſt effect of this appeared in an invaſion of Weſt Florida by the Spaniards in September 1779. As the country was in no ſtate of defence, the enemy eaſily made themſelves maſters of the whole almoſt without oppoſition. Their next enterpriſe were againſt the Bay of Honduras, where the Britiſh logwood-cutters were ſettled. Theſe finding themſelves too weak to reſiſt, applied to the governor of Jamaica for relief; who ſent them a ſupply of men, ammunition, and military ſtores, under Captain Dalrymple. Before the arrival of this detachment, the principal ſettlement in thoſe parts, called *St George's Key*, had been taken by the Spaniards and retaken by the Britiſh. In his way Captain Dalrymple fell in with a ſquadron from Admiral Parker in ſearch of ſome regiſter ſhips richly laden; but which retreating into the harbour of Omoa, were too ſtrongly protected by the fort to be attacked with ſafety. 334 Fort Omoa taken by the Britiſh. A project was then formed, in conjunction with the people of Honduras, to reduce this fort. The deſign was to ſurpriſe it; but the Spaniards having diſcovered them, they were obliged to fight. Victory quickly declared for the Britiſh; but the fortifications were ſo ſtrong, that the artillery they had brought along with them were found too light to make any impreſſion. It was then determined to try the ſucceſs of an eſcalade; and this was executed with ſo much ſpirit, that the Spaniards ſtood aſtoniſhed without making any reſiſtance, and, in ſpite of all the efforts of the officers, threw down their arms and ſurrendered. The ſpoil was immenſe, being valued at three millions of dollars. The Spaniards chiefly lamented the loſs of 250 quintals of quickſilver; a commodity indiſpenſably neceſſary in the working of their gold and ſilver mines, ſo that they offered to ranſom it at any price; but this was refuſed, as well as the ranſom of the fort, though the governor offered 300,000 dollars for it. A ſmall garriſon was left for the defence of the place: but it was quickly attacked 335 But they are obliged to evacuate it. by a ſuperior force, and obliged to evacuate it, though not without deſtroying every thing that could be of uſe to the enemy; ſpiking the guns, and even locking the gates of the fort and carrying off the keys. All this was done in ſight of the beſiegers; after which the garriſon embarked without the loſs of a man.

336 Americans take vengeance on the Indians. As no operations of any conſequence took place this year in the province of New York, the congreſs made uſe of the opportunity to diſpatch General Sullivan with a conſiderable force, in order to take vengeance on the Indians for their ravages and depredations; and the object of the expedition was, not merely the reduction of them, but if poſſible their utter extirpation. Of this the Indians were appriſed; and collecting all their ſtrength, reſolved to come to a deciſive engagement. Accordingly they took a ſtrong poſt in the moſt woody and mountainous part of the country; erecting a breaſt-work in their front of large logs of wood extending half a mile in length, while their right flank was covered by a river, and the left by a hill of difficult acceſs. This advantageous poſition they had taken by the advice of the refugees who were among them, and of whom 200 or 300 were preſent in the battle.

Thus poſted, the Indians waited the approach of the American army: but the latter having brought ſome artillery along with them, played it againſt the breaſt-work of the enemy with ſuch ſucceſs, that in two hours it was almoſt deſtroyed; and at the ſame time a party having reached the top of the hill, they became apprehenſive of being ſurrounded, on which they inſtantly fled with precipitation, leaving a great number of killed and wounded behind them. The Americans after this battle met with no further reſiſtance of any conſequence. They were ſuffered to proceed without interruption, and to execute in the moſt ample

America. ple manner the vengeance they had projected. On entering the country of the Indians, it appeared that they had been acquainted with agriculture and the arts of peace far beyond what had been supposed. From General Sullivan's account it was learned, that the Indian houses were large, convenient, and even elegant; their grounds were excellently cultivated, and their gardens abounded in fruit-trees and vegetables of all kinds fit for food. The whole of this fine country was now by the American general converted into a desart. Forty towns and settlements, besides scattered habitations, were demolished; the fields of corn, the orchards, the plantations, were utterly laid waste; all the fruit-trees were cut down; and so great had been the industry of the Indians, that in one orchard 1500 of these were destroyed. The quantity of corn wasted on this occasion was supposed to amount to 160,000 bushels. In short, such was the desolation, that on the American army's leaving the country, not a house, not a field of corn, nor a fruit-tree, was left upon the ground, nor was an Indian to be seen throughout the whole track.

We must now take a view of the transactions in the southern colonies; to which the war was, in the year 1780, so effectually transferred, that the operations there became at last decisive. The success of General Prevost in advancing to the very capital of South Carolina has been already related, together with the obstacles which prevented him from becoming master of it

337 Expedition of Sir Henry Clinton against Charlestown.

at that time. Towards the end of the year 1779, however, Sir Henry Clinton set sail from New York with a considerable body of troops, intended for the attack of Charlestown, South Carolina, in a fleet of ships of war and transports under the command of Vice-admiral Arbuthnot. They had a very tedious voyage; the weather was uncommonly bad; several of the transports were lost, as were also the greater part of the horses which they carried with them, intended for cavalry or other public uses; and an ordnance-ship likewise foundered at sea. Having arrived at Savannah, where they endeavoured to repair the damages sustained on their voyage, they proceeded from thence on the 10th of February 1780 to North Edisto, the place of debarkation which had been previously appointed. They had a favourable and speedy passage thither: and though it required time to have the bar explored and the channel marked, the transports all entered the harbour the next day; and the army took possession of John's island without opposition. Preparations were then made for passing the squadron over Charlestown bar, where the high-water spring-tides were only 19 feet deep: but no opportunity offered of going into the harbour till the 20th of March, when it was effected without any accident, though the American galleys continually attempted to prevent the English boats from sounding the channel. The British troops had previously removed from John's to James's island; and on the 29th of the same month they effected their landing on Charlestown neck. On the 1st of April they broke ground within 800 yards of the American works; and by the 8th the besiegers guns were mounted in battery.

As soon as the army began to erect their batteries against the town, Admiral Arbuthnot embraced the first favourable opportunity of passing Sullivan's island, upon which there was a strong fort of batteries, the chief defence of the harbour. He weighed on the 9th, with the Roebuck, Richmond, and Romulus, Blonde, Virginia, Raleigh, and Sandwich armed ship, the Renown bringing up the rear; and, passing through a severe fire, anchored in about two hours under James's island, with the loss of 27 seamen killed and wounded. The Richmond's fore-top-mast was shot away, and the ships in general sustained damage in their masts and rigging, though not materially in their hulls. But the Acetus transport, having on board some naval stores, grounded within gun-shot of Sullivan's island, and received so much damage that she was obliged to be abandoned and burnt.

338 The town defended by Lincoln.

On the 10th, Sir Henry Clinton and Admiral Arbuthnot summoned the town to surrender to his majesty's arms: but Major-general Lincoln, who commanded in Charlestown, returned them an answer, declaring it to be his intention to defend the place. The batteries were now opened against the town; and from their effect the fire of the American advanced works considerably abated. It appears that the number of troops under the command of Lincoln were by far too few for defending works of such extent as those of Charlestown; and that many of these were men little accustomed to military service, and very ill provided with clothes and other necessaries. Lincoln had been for some time expecting reinforcements and supplies from Virginia and other places: but they came in very slowly. Earl Cornwallis, and Lieutenant-colonel Tarleton under him, were also extremely active in intercepting such reinforcements and supplies as were sent to

339 Several reinforcements intended for his relief intercepted.

the American general. They totally defeated a considerable body of cavalry and militia which was proceeding to the relief of the town; and also made themselves masters of some posts which gave them in a great degree the command of the country, by which means great supplies of provisions fell into their hands.

Such was the state of things, and Fort Sullivan had also been taken by the king's troops, when on the 18th of May General Clinton again summoned the town to surrender; an offer being made, as had been done before, that if they surrendered, the lives and property of the inhabitants should be preserved to them. Articles of capitulation were then proposed by General Lincoln; but the terms were not agreed to by General Clinton. At length, however, the town being closely invested on all sides, and the preparations to storm it in every part being in great forwardness, and the ships ready to move to the assault, General Lincoln, who had been applied to for that purpose by the inhabitants, surrendered it on such articles of capitulation as General Clinton had before agreed to. This was on the 4th of May, which was one month and two days after the town had been first summoned to surrender.

330 The place surrendered.

A large quantity of ordnance, arms, and ammunition, was found in Charlestown; and, according to Sir Henry Clinton's account, the number of prisoners taken in Charlestown amounted to 5618 men, exclusively of near a thousand sailors in arms; but according to General Lincoln's account transmitted to the congress, the whole number of continental troops taken prisoners amounted to no more than 2487. The remainder, therefore, included in General Clinton's

America. account, muſt have conſiſted of militia and inhabitants of the town. Several American frigates were alſo taken or deſtroyed in the harbour of Charleſtown.

The loſs of Charleſtown evidently excited a conſiderable alarm in America: and their popular writers, particularly the author of the celebrated performance intitled Common Senſe, in ſome other pieces made uſe of it as a powerful argument to lead them to more vigorous exertions againſt Great Britain, that they might the more effectually and certainly ſecure their independence.

341 Apprehenſions at New York. While Sir Henry Clinton was employed in his voyage to Charleſtown, and in the ſiege of that place, the garriſon at New York ſeem not to have been wholly free from apprehenſions for their own ſafety. An intenſe froſt, accompanied with great falls of ſnow, began about the middle of December 1779, and ſhut up the navigation of the port of New York from the ſea, within a few days after the departure of Admiral Arbuthnot and General Clinton. The ſeverity of the weather increaſed to ſo great a degree, that towards the middle of January all communications with New York by water were entirely cut off, and as many new ones opened by the ice. The inhabitants could ſcarcely be ſaid to be in an inſular ſtate. Horſes with heavy carriages could go over the ice into the Jerſeys from one iſland to another. The paſſage in the North River, even in the wideſt part from New York to Paulus Hook, which was 2000 yards, was about the 19th of January practicable for the heavieſt cannon: an event which had been unknown in the memory of man. Proviſions were ſoon after tranſported upon ſledges, and a detachment of cavalry marched upon the ice from New York to Staten Iſland, which was a diſtance of 11 miles.

The city of New York being thus circumſtanced, was conſidered as much expoſed to the attacks from the continental troops: and it was ſtrongly reported that General Waſhington was meditating a great ſtroke upon New York with his whole force, by

342 Forwardneſs of the inhabitants to be inrolled for its defence. different attacks. Some time before this, Major-general Pattiſon, commandant at New York, having received an addreſs from many of the inhabitants, offering to put themſelves in military array, he thought the preſent a favourable opportunity of trying the ſincerity of their profeſſions. Accordingly he iſſued a proclamation, calling upon all the male inhabitants from 16 to 60 to take up arms. The requiſition was ſo readily complied with, that in a few days 40 companies from the ſix wards of the city were inrolled, officered, and under arms, to the number of 2600, many ſubſtantial citizens ſerving in the ranks of each company. Other volunteer companies were formed; and the city was put into a very ſtrong poſture of defence.

No attack, however, was made upon New York, whatever deſign might originally have been medi-

343 The provincials attack Staten Iſland; tated; but an attempt was made upon Staten Iſland, where there were about 1800 men, under the command of Brigadier-general Sterling, who were well intrenched. General Waſhington, whoſe army was hutted at Morris-Town, ſent a detachment of 2700 men, with ſix pieces of cannon, two mortars, and ſome horſes, commanded by Lord Sterling, who arrived at Staten Iſland early in the morning of the 15th of January. The advanced poſts of the Britiſh troops retired upon the approach of the Americans, who formed the line, and made ſome movements in the courſe of the day; but they withdrew in the night, after having burnt one houſe, pillaged ſome others, and carried off with them about 200 head of cattle. Immediately on the arrival of the Americans on Staten Iſland, Lieutenant-general Knyphauſen had embarked 600 men to attempt a paſſage, and to ſupport General Sterling: but the floating ice compelled them to return. It is, however, imagined, that the appearance of theſe tranſports, with the Britiſh troops on board, which the Americans could ſee towards the cloſe of the day, induced the latter to make ſo precipitate a retreat. 344 But are induced to make a precipitate retreat.

After Charleſtown had ſurrendered to the king's troops, General Clinton iſſued two proclamations, and alſo circulated a hand-bill amongſt the inhabitants of South Carolina, in order to induce them to return to their allegiance, and to be ready to join the king's troops. It was ſaid, that the helping hand of every man was wanted to re-eſtabliſh peace and good government: and that as the commander in chief wiſhed not to draw the king's friends into danger, while any doubt could remain of their ſucceſs; ſo now that this was certain, he truſted that one and all would heartily join, and by a general concurrence give effect to ſuch neceſſary meaſures for that purpoſe as from time to time might be pointed out. Thoſe who had families were to form a militia to remain at home, and occaſionally to aſſemble in their own diſtricts, when required, under officers of their own chooſing, for the maintenance of peace and good order. Thoſe who had no families, and who could conveniently be ſpared for a time, it was preſumed, would cheerfully aſſiſt his majeſty's troops in driving their oppreſſors, acting under the authority of congreſs, and all the miſeries of war, far from that colony. For this purpoſe it was ſaid to be neceſſary that the young men ſhould be ready to aſſemble when required, and to ſerve with the king's troops for any ſix months of the enſuing twelve that might be found requiſite, under proper regulations. They might chooſe officers to each company to command them; and were to be allowed, when on ſervice, pay, ammunition, and proviſions, in the ſame manner as the king's troops. When they joined the army, each man was to be furniſhed with a certificate, declaring that he was only engaged to ſerve as a militia-man for the time ſpecified; that he was not to be marched beyond North Carolina and Georgia; and that, when the time was out, he was freed from all claims whatever of military ſervice, excepting the common and uſual militia-duty where he lived. He would then, it was ſaid, have paid his debt to his country, and be intitled to enjoy undiſturbed that peace, liberty, and property, at home, which he had contributed to ſecure. The proclamations and publications of General Clinton appear to have produced ſome effect in South Carolina; though they probably operated chiefly upon thoſe who were before not much inclined to the cauſe of American independence. Two hundred and ten of the inhabitants of Charleſtown ſigned an addreſs to General Clinton and Admiral Arbuthnot, ſoliciting to be readmitted to the character and condition of Britiſh ſubjects, the inhabitants of that city having been hitherto conſidered as priſoners on parole; declaring their 345 Proclamations by General Clinton.

America.

their diſapprobation of the doctrine of American independence; and expreſſing their regret, that after the repeal of thoſe ſtatutes which gave riſe to the troubles in America, the overtures made by his majeſty's commiſſioners had not been regarded by the congreſs. Sir Henry Clinton, in one of the proclamations iſſued at this time, declared, that if any perſons ſhould thenceforward appear in arms in order to prevent the eſtabliſhment of his majeſty's government in that country, or ſhould under any pretence or authority whatſoever attempt to compel any other perſon or perſons to do ſo, or who ſhould hinder or intimidate the king's faithful and loyal ſubjects from joining his forces or otherwiſe performing thoſe duties their allegiance required, ſuch perſons ſhould be treated with the utmoſt ſeverity, and their eſtates be immediately ſeized in order to be confiſcated.

Mean time the ravages of war did not prevent the Americans from paying ſome attention to the arts of peace. On the 4th of May an act paſſed by the council and houſe of repreſentatives of Maſſachuſet's Bay for incorporating and eſtabliſhing a ſociety for the cultivation and promotion of the arts and ſciences. See ACADEMY, p. 43. col. 2.

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Proceedings of congreſs.

Some doubts having ariſen in the congreſs, towards the cloſe of the preceding year, about the propriety of their aſſembling in the city of Philadelphia, it was now reſolved that they ſhould continue to meet there: and a committee of three members was appointed, to report a proper place where buildings might be provided for the reception of the congreſs, together with an eſtimate of the expence of providing ſuch buildings and the neceſſary offices for the ſeveral boards. It was alſo reſolved by the congreſs, that a monument ſhould be erected to the memory of their late general Richard Montgomery, who fell at Quebec, in teſtimony of his ſignal and important ſervices to the United States of America, with an inſcription expreſſive of his amiable character and heroic atchievements; and that the continental treaſurers ſhould be directed to advance a ſum not exceeding L. 300 to Dr Franklin to defray the expence; that gentleman being deſired to cauſe the monument to be executed at Paris, or in ſome other part of France. It was likewiſe reſolved by the congreſs, that a court ſhould be eſtabliſhed for the trial of all appeals from the court of admiralty of the United States of America, in caſes of capture; to conſiſt of three judges, appointed and commiſſioned by congreſs, and who were to take an oath of office; and that the trials in this court ſhould be determined by the uſage of nations.

347
Difficulties ariſing from the depreciation of their paper-currency.

The difficulties of the congreſs and of the people of America had been greatly increaſed by the depreciation of their paper currency. At the time when the colonies engaged in a war with Great Britain, they had no regular civil governments eſtabliſhed among them of ſufficient energy to enforce the collection of taxes, or to provide funds for the redemption of ſuch bills of credit as their neceſſities obliged them to iſſue. In conſequence of this ſtate of things, their bills increaſed in quantity far beyond the ſum neceſſary for the purpoſe of a circulating medium: and as they wanted at the ſame time ſpecific funds to reſt on for their redemption, they ſaw their paper-currency daily ſink in value. The depreciation continued, by a kind of gradual progreſſion, from the year 1777 to 1780: ſo that, at the latter period, the continental dollars were paſſed, by common conſent, in moſt parts of America, at the rate of at leaſt $\frac{39}{40}$ths below their nominal value. The impoſſibility of keeping up the credit of the currency to any fixed ſtandard, occaſioned great and almoſt inſurmountable embarraſſments in aſcertaining the value of property, or carrying on trade with any ſufficient certainty. Thoſe who ſold, and thoſe who bought, were left without a rule whereon to form a judgment of their profit or their loſs; and every ſpecies of commerce or exchange, whether foreign or domeſtic, was expoſed to numberleſs and increaſing difficulties. The conſequences of the depreciation of the paper-currency were alſo felt with peculiar ſeverity by ſuch of the Americans as were engaged in their military ſervices, and greatly augmented their other hardſhips. The requiſitions made by the congreſs to the ſeveral colonies for ſupplies, were alſo far from being always regularly complied with: and their troops were not unfrequently in want of the moſt common neceſſaries; which naturally occaſioned complaints and diſcontent among them. Some of theſe difficulties, reſulting from their circumſtances and ſituation, perhaps no wiſdom could have prevented: but they ſeem to have ariſen in part from the congreſs not being ſufficiently acquainted with the principles of finance, and from a defect of ſyſtem in the departments of their government. The cauſe of the Americans appears alſo to have ſuffered ſomewhat by their depending too much on temporary enliſtments. But the congreſs endeavoured, towards the cloſe of the year 1780, to put their army upon a more permanent footing, and to give all the ſatisfaction to their officers and ſoldiers which their circumſtances would permit. They appointed a committee for arranging their finances, and made ſome new regulations reſpecting their war-office and treaſury-board, and other public departments.

348
Anniverſary of American independency celebrated at Philadelphia.

Notwithſtanding the diſadvantages under which they laboured, the Americans ſeemed to entertain no doubts but that they ſhould be able to maintain their independency. The 4th of July was celebrated this year at Philadelphia with ſome pomp, as the anniverſary of American independence. A commencement for conferring degrees in the arts was held the ſame day, in the hall of the univerſity there; at which the preſident and members of the congreſs attended, and other perſons in public offices. The Chevalier De la Lucerne, miniſter plenipotentiary from the French king to the United States, was alſo preſent on the occaſion. A charge was publicly addreſſed by the provoſt of the univerſity to the ſtudents; in which he ſaid, that he could not but congratulate them "on that auſpicious day, which, amidſt the confuſions and deſolations of war, beheld learning beginning to revive; and animated them with the pleaſing proſpect of ſeeing the ſacred lamp of ſcience burning with a ſtill brighter flame, and ſcattering its invigorating rays over the unexplored deſerts of that extenſive continent; until the whole world ſhould be involved in the united blaze of knowledge, liberty, and religion. When he ſtretched his views forward (he ſaid), and ſurveyed the riſing glories of America, the enriching conſequences of their determined ſtrug-

America.

gle for liberty, the extensive fields of intellectual improvement and useful invention, in science and arts, in agriculture and commerce, in religion and government, through which the unfettered mind would range, with increasing delight, in quest of the undiscovered treasure which yet lay concealed in the animal, vegetable, and mineral kingdoms of that new world; or in the other fertile sources of knowledge with which it abounded. His heart swelled with the pleasing prospect, that the sons of that institution would distinguish themselves, in the different walks of life, by their literary contributions to the embellishment and increase of human happiness."

349 A large body of French troops land at Rhode Island.

On the 10th of July, M. Ternay, with a fleet consisting of seven ships of the line, besides frigates, and a large body of French troops, commanded by the Count de Rochambeau, arrived at Rhode Island; and the following day 6000 men were landed there. A committee from the general assembly of Rhode Island was appointed to congratulate the French general upon his arrival: whereupon he returned an answer, in which he informed them, that the king his master had sent him to the assistance of his good and faithful allies the United States of America. At present, he said, he only brought over the vanguard of a much greater force destined for their aid; and the king had ordered him to assure them, that his whole power should be exerted for their support. He added, that the French troops were under the strictest discipline; and, acting under the orders of General Washington, would live with the Americans as their brethren.

A scheme was soon after formed, of making a combined attack with English ships and troops, under the command of Sir Henry Clinton and Admiral Arbuthnot, against the French fleet and troops at Rhode Island. Accordingly a considerable part of the troops at New York were embarked for that purpose. General Washington having received information of this, passed the North River, by a very rapid movement, and, with an army increased to 12,000 men, proceeded with celerity towards King's Bridge, in order to attack New York; but learning that the British general had changed his intentions, and disembarked his troops on the 31st of the month, General Washington recrossed the river, and returned to his former station. Sir Henry Clinton and the Admiral had agreed to relinquish their design of attacking the French and Americans at Rhode Island as impracticable for the present.

350 Unsuccessful expedition in the Jerseys.

An unsuccessful attempt was also made about this time in the Jerseys by General Knyphausen, with 7000 British troops under his command, to surprise the advanced posts of General Washington's army. They proceeded very rapidly towards Springfield, meeting little opposition till they came to the bridge there, which was very gallantly defended by 170 of the continental troops, for 15 minutes, against the British army: but they were at length obliged to give up so unequal a contest, with the loss of 37 men. After securing this pass, the British troops marched into the place, and set fire to most of the houses. They also committed some other depredations in the Jerseys; but gained no laurels there, being obliged to return about the beginning of July without effecting any thing material.

But in South Carolina the royal arms were attended with more success. Earl Cornwallis, who commanded the British troops there, obtained a very signal victory over General Gates on the 16th of August. The action began at break of day, in a situation very advantageous for the British troops, but very unfavourable to the Americans. The latter were much more numerous; but the ground on which both armies stood was narrowed by swamps on the right and left, so that the Americans could not properly avail themselves of their superior numbers. There seems to have been some want of generalship in Gates, in suffering himself to be surprised in so disadvantageous a position: but this circumstance was partly the effect of accident; for both armies set out with a design of attacking each other precisely at the same time, at ten the preceding evening, and met together before day-light at the place where the action happened. The attack was made by the British troops with great vigour, and in a few minutes the action was general along the whole line. It was at this time a dead calm, with a little haziness in the air, which preventing the smoke from rising, occasioned so thick a darkness, that it was difficult to see the effect of a very heavy and well-supported fire on both sides. The British troops either kept up a constant fire, or made use of bayonets, as opportunities offered; and after an obstinate resistance during three quarters of an hour, threw the Americans into total confusion, and forced them to give way in all quarters. The continental troops appear to have behaved well, but the militia were soon broken, and left the former to oppose the whole force of the British troops. General Gates did all in his power to rally the militia, but without effect: the continentals retreated in some order; but the rout of the militia was so great, that the British cavalry are said to have continued the pursuit of them to the distance of 22 miles from the place where the action happened. The loss of the Americans was very considerable: about 1000 prisoners were taken, and more are said to have been killed and wounded, but the number is not very accurately ascertained. Seven pieces of brass cannon, a number of colours, and all the ammunition-waggons of the Americans, were also taken. Of the British troops, the killed and wounded amounted to 213. Among the prisoners taken was Major-general Baron de Kalb, a Prussian officer in the American service, who was mortally wounded, having exhibited great gallantry in the course of the action, and received 11 wounds. The British troops by which this great victory was achieved, did not much exceed 2000, while the American army is said to have amounted to 6000; of which, however, the greatest part was militia.

351 Victory obtained by Lord Cornwallis over Gen. Gates.

352 Activity of Lieut. Col. Tarleton.

Lieutenant-colonel Tarleton, who had greatly distinguished himself in this action, was detached the following day, with some cavalry and light infantry, amounting to about 350 men, to attack a corps of Americans under General Sumpter. He executed this service with great activity and military address. He procured good information of Sumpter's movements; and by forced and concealed marches came up with and surprised him in the middle of the day on the 18th, near the Catawba fords. He totally destroyed or dispersed his detachment, which consisted of 700 men, killing 150 on the spot, and taking two pieces of brass cannon, 300 prisoners, and 44 waggons.

America.

353 General Arnold desert the service of congress.

Not long after these events, means were found to detach Major-general Arnold, who had engaged so ardently in the cause of America, and who had exhibited so much bravery in the support of it, from the interests of the congress. Major André, adjutant-general to the British army, was a principal agent in this transaction: or, if the overture of joining the king's troops came first from Arnold, this gentleman was the person employed to concert the affair with him. More must have been originally comprehended in the scheme than the mere desertion of the American cause by Arnold: but whatever designs had been formed for promoting the views of the British government, they were frustrated by the apprehending of Major André. He was taken in disguise, after having assumed a false name, on the 23d of September, by three American soldiers; to whom he offered considerable rewards if they would have suffered him to escape, but without effect. Several papers written by Arnold were found upon him; and when Arnold had learnt that Major André was seized, he found means to get on board a barge, and to escape to one of the king's ships. General Washington referred the case of Major André to the examination and decision of a board of general officers, consisting of Major-general Green, Major-general Lord Sterling, Major-general the Marquis de la Fayette, Major-general the Baron de Stenben, two other major-generals, and eight brigadier-generals. Major André was examined before them, and the particulars of his case inquired into; and they reported to the American commander in chief, that Mr André came on shore from the Vulture sloop of war in the night, on an interview with General Arnold, in a private and secret manner; that he changed his dress within the American lines; and, under a feigned name, and in a disguised habit, passed the American works at Stoney and Verplank's points, on the evening of the 22d of September; that he was taken on the morning of the 23d at Tarry-town, he being then on his way for New York; and that, when taken, he had in his possession several papers which contained intelligence for the enemy. They therefore determined, that he ought to be considered as a spy from the enemy; and that, agreeable to the law and usage of nations, he ought to suffer death. Sir Henry Clinton, Lieutenant-general Robertson, and the late American general Arnold, all wrote pressing letters to General Washington on the occasion, in order to prevent the decision of the board of general officers from being put in force: But their applications were ineffectual. Major André was hanged at Tappan, in the province of New York, on the 2d of October. He met his fate with great firmness; but appeared somewhat hurt that he was not allowed a more military death, for which he had solicited. He was a gentleman of very amiable qualities, had a taste for literature and the fine arts, and possessed many accomplishments. His death, therefore, was regretted even by his enemies; and the severity of the determination concerning him was much exclaimed against in Great Britain. It was, however, generally acknowledged by impartial persons, that there was nothing in the execution of this unfortunate gentleman but what was perfectly consonant to the rules of war.

354 Unhappy fate of Major André.

355 His amiable character.

Arnold was made a brigadier-general in the king's service, and published an address to the inhabitants of America, dated from New York October 7, in which he endeavoured to justify his desertion of their cause. He said, that when he first engaged in it, he conceived the rights of his country to be in danger, and that duty and honour called him to her defence. A redress of grievances was his only aim and object; and therefore he acquiesced unwillingly in the declaration of independence, because he thought it precipitate. But what now induced him to desert their cause was the disgust he had conceived at the French alliance, and at the refusal of congress to comply with the last terms offered by Great Britain, which he thought equal to all their expectations and to all their wishes.

356 Motives assigned by Arnold for his conduct.

The Americans, however, accounted for the conduct of Arnold in a different manner. They alleged that he had so involved himself in debts and difficulties by his extravagant manner of living in America, that he had rendered it very inconvenient for him to continue there: that after the evacuation of Philadelphia by the British troops, Arnold, being invested with the command in that city, had made the house of Mr Penn, which was the best in the city, his head-quarters. This he had furnished in an elegant and expensive manner, and lived in a style far beyond his income. It was manifest, they said, that he could at first have no great aversion to the French alliance, because that when M. Gerard, minister plenipotentiary from the court of France, arrived at Philadelphia in July 1778, General Arnold early and earnestly solicited that minister, with his whole suite, to take apartments and bed and board at his house, until a proper house could be provided by the order of the congress. This offer M. Gerard accepted, and continued with him some weeks. The French minister resided upwards of 14 months in Philadelphia; during which time General Arnold kept up the most friendly and intimate acquaintance with him, and there was a continued interchange of dinners, balls, routes, and concerts: so that M. Gerard must have believed, that in General Arnold he had found and left one of the warmest friends the court of France had in America. He was also one of the first in congratulating the Chevalier la Luzerne, the second French minister. About this time complaints and accusations were exhibited against him by the government of Philadelphia for divers mal-practices; among which charges were, the appropriation of goods and merchandise to his own use, which he had seized as British property in Philadelphia in July 1778. It was determined by a court-martial that his conduct was highly reprehensible; but he was indulgently treated, and was therefore only reprimanded by the commander in chief General Washington. It was in these circumstances, the Americans said, bankrupted in reputation and fortune, loaded with debts, and having a growing and expensive family, that General Arnold first turned his thoughts towards joining the royal arms.

357 Different reasons alleged by the Americans.

358 Actions in South Carolina.

After the defeat of General Gates by Earl Cornwallis, that nobleman exerted himself to the utmost in extending the progress of the British arms, and with considerable effect. But one enterprize, which was conducted by Major Ferguson, proved unsuccessful. That officer had taken abundant pains to discipline some of the Tory militia, as they were termed; and with a party of these and some British troops, amounting

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merica. in the whole to about 1400 men, made incursions into the country. But on the 7th of October he was attacked by a superior body of Americans at a place called King's-mountain, and totally defeated. One hundred and fifty were killed in the action, and 810 made prisoners, of which 150 were wounded. Fifteen hundred stands of arms also fell into the hands of the Americans, whose loss was inconsiderable. But the following month Lieutenant-colonel Tarleton, who continued to exert his usual activity and bravery, with a party of 170, chiefly cavalry, attacked and defeated General Sumpter, who is said to have had 1000 men, at a place called Black Stocks. Sumpter was wounded, and about 120 of the Americans killed, wounded, or taken. Of the British troops about 50 were killed and wounded.

359 pture of r Laurens.

On the 3d of September, the Mercury, a congress packet, was taken by the Vestal, captain Keppel, near Newfoundland. On board this packet was Mr Laurens, late president of the congress, who was bound on an embassy to Holland. He had thrown his papers overboard, but great part of them were recovered without having received much damage. He was brought to London, and examined before the privy-council; in consequence of which he was committed close prisoner to the Tower on the 6th of October, on a charge of high treason. His papers were delivered to the ministry, and contributed to facilitate a rupture with Holland, as among them was found the sketch of a treaty of amity and commerce between the republic of Holland and the United States of America.

360 contents long the merican ops.

At the beginning of the year 1781, an affair happened in America, from which expectations were formed by Sir Henry Clinton, that some considerable advantage might be derived to the Royal cause. The long continuance of the war, and the difficulties under which the congress laboured, had prevented their troops from being properly supplied with necessaries and conveniences. In consequence of this, on the first of January, the American troops that were hutted at Morris town, and who formed what was called the *Pensylvania line*, turned out, being in number about 1300, and declared, that they would serve no longer, unless their grievances were redressed, as they had not received their pay, or been furnished with the necessary cloathing or provisions. It is said that they were somewhat inflamed with liquor, in consequence of rum having been distributed to them more liberally than usual, New-year's day being considered as a kind of festival. A riot ensued, in which an officer was killed, and four wounded; five or six of the insurgents were also wounded. They then collected the artillery, stores, provisions, and waggons, and marched out of the camp. They passed by the quarters of General Wayne, who sent a message to them, requesting them to desist, or the consequences would prove fatal. They refused, and proceeded on their march till the evening, when they took

361 evolt of e Pensyl nia line.

post on an advantageous piece of ground, and elected officers from among themselves. On the second, they marched to Middlebrook, and on the third to Prince-town, where they fixed their quarters. On that day a flag of truce was sent to them from the officers of the American camp, with a message, desiring to know what were their intentions. Some of them answered, that they had already served longer than the time for which they were enlisted, and would serve no longer; and others, that they would not return, unless their grievances were redressed. But at the same time they repeatedly, and in the strongest terms, denied being influenced by the least disaffection to the American cause, or having any intentions of deserting to the enemy. America.

Intelligence of this transaction was soon conveyed to New York. A large body of British troops were immediately ordered to hold themselves in readiness to move on the shortest notice, it being hoped that the American revolters might be induced to join the Royal army. Messengers were also sent to them from General Clinton, acquainting them that they should directly be taken under the protection of the British government; that they should have a free pardon for all former offences; and that the pay due to them from the congress should be faithfully paid them, without any expectation of military service, unless it should be voluntary, upon condition of their laying down their arms and returning to their allegiance. It was also recommended to them to move beyond the South river; and they were assured, that a body of British troops should be ready to protect them whenever they desired it. These propositions were rejected with disdain; and they even delivered up two of Sir Henry Clinton's messengers to the congress. Joseph Reed, Esq; president of the state of Pensylvania, afterwards repaired to them at Prince-town, and an accommodation took place: such of them as had served out their full terms were permitted to return to their own homes, and others again joined the American army, upon receiving satisfactory assurances that their grievances should be redressed. 362 Ineffectual attempts to induce them to join the royal army.

Lord Cornwallis now began to make very vigorous exertions, in order to penetrate into North Carolina. On the 11th of January his Lordship's army was in motion, and advancing towards that province; but was somewhat delayed by an attempt made by the Americans, under General Morgan, to make themselves masters of the valuable district of Ninety-six. In order to prevent this, Lord Cornwallis detached Lieutenant-colonel Tarleton, with 300 cavalry, 300 light infantry, the 7th regiment, the first battalion of the 71st regiment, and two three-pounders, to oppose the progress of Morgan, not doubting but that he would be able to perform this service effectually. The British troops came up with the Americans under General Morgan on the 17th of January. The Americans were drawn up in an open wood, and having been lately joined by some militia, were more numerous than the British troops under Lieutenant-colonel Tarleton; but the latter were so much better disciplined, that they had the utmost confidence of obtaining a speedy victory. The attack was begun by the first line of infantry, consisting of the 7th regiment, and a corps of light infantry with a troop of cavalry placed on each flank. The first battalion of the 71st and the remainder of the cavalry formed the reserve. The American line soon gave way, and their militia quitted the field; upon which the Royal troops, supposing the victory already gained, engaged with ardour in the pursuit, and were thereby thrown into some disorder. General Morgan's corps, who were supposed to have been routed, then immediately faced about, and threw in a heavy fire upon the King's troops, which occasioned the utmost confusion amongst 363 Exertions of Lord Cornwallis in North Carolina.

America.

amongſt them; and they were at length totally defeated by the Americans.

364 Defeat of Col. Tarleton.

Four hundred of the Britiſh infantry were either killed, wounded, or taken priſoners: the loſs of the cavalry was much leſs conſiderable; but the two three-pounders fell into the hands of the Americans, together with the colours of the 7th regiment; and all the detachment of royal artillery were either killed or wounded in defence of their colours. Lieutenant-colonel Tarleton, however, made another effort; having aſſembled about 50 of his cavalry, with which he charged and repulſed Colonel Waſhington's horſe, retook his baggage, and killed the Americans

365 Operations in conſequence of that event.

who were appointed to guard it. He then retreated to Hamilton's ford, near the mouth of Bullock's creek, carrying with him part of his baggage, and deſtroying the remainder.

This defeat of the troops under Tarleton was a ſevere ſtroke to Lord Cornwallis, as the loſs of his light infantry was a great diſadvantage to him. The day after that event, he employed in collecting the remains of Tarleton's corps, and in endeavouring to form a junction with General Leſlie, who had been ordered to march towards him with a body of Britiſh troops from Wynneſborough. Conſiderable exertions were then made by part of the army, without baggage, to retake the priſoners in the hands of the Americans, and to intercept General Morgan's corps on its retreat to the Catawba. But that American officer, after his defeat of Tarleton, had made forced marches up into the country, and croſſed the Catawba the evening before a great rain, which ſwelled the river to ſuch a degree, as to prevent the Royal army from croſſing for ſeveral days; during which time the Britiſh priſoners were got over the Yadkin; whence they proceeded to Dan River, which they alſo paſſed, and on the 14th of February had reached Court-houſe in the province of Virginia.

366 Lord Cornwallis marches thro' North Carolina.

Lord Cornwallis employed a halt of two days in collecting ſome flour, and in deſtroying ſuperfluous baggage and all his waggons, excepting thoſe laden with hoſpital ſtores, ſalt, and ammunition, and four reſerved empty in readineſs for ſick or wounded. Being thus freed from all unneceſſary incumbrances, he marched through North Carolina with great rapidity, and penetrated to the remoteſt extremities of that province on the banks of the Dan. His progreſs was ſometimes impeded by parties of the militia, and ſome ſkirmiſhes enſued, but he met with no very conſiderable oppoſition. On the firſt of February, the King's troops croſſed the Catawba at M'Cowan's Ford, where General Davidſon, with a party of American militia, was poſted, in order to oppoſe their paſſage; but he falling by the firſt diſcharge, the Royal troops made good their landing, and the militia retreated. When Lord Cornwallis arrived at Hillſborough, he erected the king's ſtandard, and invited, by proclamation, all loyal ſubjects to repair to it, and to ſtand forth and take an active part in aſſiſting his Lordſhip to reſtore order and government. He had been taught to believe that the king's friends were numerous in that part of the country: but the event did not confirm the truth of the repreſentations that had been given. The Royaliſts were but few in number, and ſome of them too timid to join the King's ſtandard. There were, indeed, about 200 who were proceeding to Hillſborough, under Colonel Pyle, in order to avow their attachment to the Royal cauſe; but they were met accidentally, and ſurrounded by a detachment from the American army, by whom a number of them are ſaid to have been killed when they were begging for quarter, without making the leaſt reſiſtance. Meanwhile General Greene was marching with great expedition with the troops under his command, in order to form a junction with other corps of American troops, that he might thereby be enabled to put ſome effectual ſtop to the progreſs of Lord Cornwallis.

In other places ſome conſiderable advantages were obtained by the royal arms. On the 4th of January, ſome ſhips of war with a number of tranſports, on board

367 Large quantities of American ſtores deſtroyed by Arnold.

which was a large body of troops under the command of Brigadier-general Arnold, arrived at Weſtover, about 140 miles from the Capes of Virginia, where the troops immediately landed and marched to Richmond; which they reached without oppoſition, the militia that was collected having retreated on their approach. Lieutenant-colonel Simcoe marched from hence with a detachment of the Britiſh troops to Weſtham, where they deſtroyed one of the fineſt founderies for cannon in America, and a large quantity of ſtores and cannon. General Arnold, on his arrival at Richmond, found there large quantities of ſalt, rum, ſail-cloth, tobacco, and other merchandize, and that part of theſe commodities which was public property he deſtroyed. The Britiſh troops afterwards attacked and diſperſed ſome ſmall parties of the Americans, took ſome ſtores and a few pieces of cannon, and on the 20th of the ſame month marched into Portſmouth. On the 25th, Captain Barclay, with ſeveral ſhips of war, and a body of troops under the command of Major Craig, arrived in Cape Fear river. The troops landed about nine miles from Wilmington, and on the 28th entered that town. It was underſtood that their having poſſeſſion of that town, and being maſters of Cape Fear river, would be productive of very beneficial effects to Lord Cornwallis's army.

General Greene having effected a junction about the 10th of March with a continental regiment of what

368 Different ſkirmiſhes.

were called *eighteen months men*, and two large bodies of militia belonging to Virginia and North Carolina, formed a reſolution to attack the Britiſh troops under the command of Lord Cornwallis. The American army marched from the High Rock Ford on the 12th of the month, and on the 14th arrived at Guildford. Lord Cornwallis, from the information he had received of the motions of the American general, concluded what were his deſigns. As they approached more nearly to each other, a few ſkirmiſhes enſued between ſome advanced parties, in which the king's troops had the advantage. On the morning of the 15th, Lord Cornwallis marched with his troops at day-break in order to meet the Americans or to attack them in their encampment. About four miles from Guildford, the advanced guard of the Britiſh army, commanded by Lieutenant-colonel Tarleton, fell in with a corps of the Americans, conſiſting of Lieutenant-colonel Lee's legion, ſome Back Mountain men and Virginian militia, with whom he had a ſevere ſkirmiſh, but whom he at length obliged to retreat.

The greater part of the country in which the action happened is a wilderneſs, with a few cleared fields interſperſed. The American army, which was ſuperior

to the royal in point of numbers, was poſted on a riſing ground about a mile and a half from Guildford

369 Battle at Guilford. court-houſe. It was drawn up in three lines: the front line was compoſed of the North Carolinian militia, under the command of the generals Butler and Eaton; the ſecond line of Virginian militia, commanded by the generals Stephens and Lawſon, forming two brigades; the third line, conſiſting of two brigades, one of Virginia and one of Maryland continental troops, commanded by General Huger and Colonel Williams. Lieutenant-colonel Waſhington, with the dragoons of the firſt and third regiments, a detachment of light infantry compoſed of continental troops, and a regiment of riflemen under Colonel Lynch, formed a corps of obſervation for the ſecurity of their right flank. Lieutenant-colonel Lee, with his legion, a detachment of light infantry, and a corps of riflemen under Colonel Campbell, formed a corps of obſervation for the ſecurity of their left flank. The attack of the American army was directed to be made by Lord Cornwallis in the following order: On the right, the regiment of Boſe and the 71ſt regiment, led by Major-general Leſlie, and ſupported by the firſt battalion of guards; on the left, the 23d and 33d regiments, led by Lieutenant-colonel Webſter, and ſupported by the grenadiers and ſecond battalion of guards commanded by Brigadier-general O'Hara; the Yagers and light infantry of the guards remained in a wood on the left of the guns, and the cavalry in the road, ready to act as circumſtances might require.

About half an hour after one in the afternoon, the action commenced by a cannonade, which laſted about twenty minutes; when the Britiſh troops advanced in three columns and attacked the North Carolinian brigades with great vigour, and ſoon obliged part of theſe troops, who behaved very ill, to quit the field: but the Virginia militia gave them a warm reception, and kept up a heavy fire for a long time, till being beaten back the action became general almoſt every where. The American corps under the lieutenant-colonels Waſhington and Lee were alſo warmly engaged, and did conſiderable execution. Lieutenant-colonel Tarleton had directions to keep his cavalry compact, and not to charge without poſitive orders, excepting to protect any of the corps from the moſt evident danger of being defeated. The exceſſive thickneſs of the woods rendered the Britiſh bayonets of little uſe, and enabled the broken corps of Americans to make frequent ſtands with an irregular fire. The ſecond battalion of the guards firſt gained the clear ground near Guildford court-houſe, and found a corps of continental infantry, ſuperior in number, formed in an open field on the left of the road. Deſirous of ſignalizing themſelves, they immediately attacked and ſoon defeated them, taking two ſix-pounders: but as they purſued the Americans into the wood with too much ardour, they were thrown into confuſion by a heavy fire, and inſtantly charged and driven back into the field by Lieutenant-colonel Waſhington's dragoons, with the loſs of the ſix-pounders they had taken. But the American cavalry were afterwards repulſed, and the two ſix pounders again fell into the hands of the Britiſh

370 The Americans defeated. troops. The ſpirited exertions of Brigadier-general O'Hara and of Lieutenant-colonel Tarleton, greatly contributed to bring the action to a termination. The Britiſh troops having at length broken the ſecond Maryland regiment, and turned the left flank of the Americans, got into the rear of the Virginian brigade, and appeared to be gaining their right, which would have encircled the whole of the continental troops, when General Greene thought it prudent to order a retreat. Many of the American militia diſperſed in the woods; but the continental troops retreated in good order to the Reedy Fork River, and croſſed at the ford about three miles from the field of action, and there halted. When they had collected their ſtragglers, they retreated to the iron-works, ten miles diſtant from Guildford, where they encamped. They loſt their artillery and two waggons laden with ammunition. It was a hard-fought action, and laſted an hour and a half. Of the Britiſh troops, the loſs, as ſtated by Lord Cornwallis, was 532 killed, wounded, and miſſing. General Greene, in his account of the action tranſmitted to the congreſs, ſtated the loſs of the continental troops to amount to 329 killed, wounded, and miſſing; but he made no eſtimate of the loſs of the militia. Lieutenant-colonel Stuart was killed in the action; and Lieutenant-colonel Webſter, and the captains Schutz, Maynard, and Goodriche, died of the wounds that they received in it. Brigadier-general O'Hara, Brigadier-general Howard, and Lieutenant-colonel Tarleton, were alſo wounded. Of the Americans the principal officer killed was Major Anderſon of the Maryland line, and the generals Stephens and Huger were wounded.

The Britiſh troops underwent great hardſhips in the courſe of this campaign; and in a letter of Lord Cornwallis's to Lord George Germain, dated March 17th, he obſerved, that "the ſoldiers had been two days without bread." His lordſhip quitted Guildford three days after the battle which was fought in that place; and on the 7th of April arrived in the neighbourhood of Wilmington. Soon after, General Greene, notwithſtanding his late defeat, endeavoured to make ſome vigorous attempts againſt the king's forces in South Carolina. Lord Rawdon had been appointed to defend the Poſt of Camden, with about 800 Britiſh and provincials; and on the 19th of April General Greene appeared before that place with a large body of continentals and militia. He found it, however, impoſſible to attempt to ſtorm the town with any proſpect of ſucceſs; and therefore endeavoured to take ſuch a poſition as ſhould enduce the Britiſh troops to ſally from their works. He poſted the Americans about a mile from the town, on an eminence which was covered with woods, and flanked on the left by an impaſſable ſwamp. But on the morning of the 25th, Lord Rawdon marched out of Camden, and with great gallantry attacked General Greene in his camp. The Americans made a vigorous reſiſtance, but were at laſt compelled to give way; and the purſuit is ſaid to have been continued three miles. For ſome time after the action commenced, General Gates entertained great hopes of defeating the Britiſh troops; in which, as the Americans were ſuperior in point of numbers, he would probably have ſucceeded, had not ſome capital military errors been committed by one or two of the officers who ſerved under him. On the American ſide Colonel Waſhington had behaved extremely well in this action, having made upwards of 200 of the Engliſh

371 Hardſhips endured by the Britiſh troops.

372 General Green attacked in his camp by Lord Rawdon, and defeated.

America. liſh priſoners, with 10 or 12 officers, before he perceived that the Americans were abandoning the field of battle. The loſs of the Engliſh was about 100 killed and wounded. Upwards of 100 of the Americans were taken priſoners; and, according to the account publiſhed by General Greene, they had 126 killed and wounded. After this action, Greene retreated to Rugeley's mills, 12 miles from Camden, in order to collect his troops and wait for reinforcements.

Notwithſtanding the advantage which Lord Rawdon had obtained over General Greene at Camden, that nobleman ſoon after found it neceſſary to quit that poſt; and the Americans made themſelves maſters of ſeveral other poſts that were occupied by the king's troops, and the garriſons of which were obliged to ſurrender themſelves priſoners of war. Theſe troops were afterwards exchanged under a cartel which took place between Lord Cornwallis and General Greene for the releaſe of all priſoners of war in the ſouthern diſtrict.

373 Afterwards lays ſiege to Ninety-ſix; but is repulſed. After theſe events, General Greene laid cloſe ſiege to Ninety-ſix, which was conſidered as the moſt commanding and important of all the poſts in the back-country; and on the 19th of June he attempted to ſtorm the garriſon, but was repulſed by the gallantry of the Britiſh troops, with the loſs, as it is ſaid, of 75 killed and 150 wounded. General Greene then raiſed the ſiege, and retired with his army behind the Saluda, to a ſtrong ſituation, within 16 miles of Ninety-ſix.

On the 18th of April a large body of Britiſh troops, under the command of Major-general Philips and Brigadier-general Arnold, embarked at Portſmouth in Virginia, in order to proceed on an expedition for the purpoſe of deſtroying ſome of the American ſtores. A party of light-infantry were ſent 10 or 12 miles up the Chickahomany; where they deſtroyed ſeveral armed ſhips, ſundry warehouſes, and the American ſtate ſhip-

374 Deſtruction of American ſtores. yards. At Peterſburgh, the Engliſh deſtroyed 4000 hogſheads of tobacco, one ſhip, and a number of ſmall veſſels on the ſtocks and in the river. At Cheſterfield court-houſe, they burnt a range of barracks for 2000 men and 300 barrels of flour. At a place called *Oſborn's*, they made themſelves maſters of ſeveral veſſels loaded with cordage and flour, and deſtroyed about 2000 hogſheads of tobacco, and ſundry veſſels were ſunk and burnt. At Warwick, they burnt a magazine of 500 barrels of flour, ſome fine mills belonging to Colonel Carey, a large range of public rope-walks and ſtore-houſes, tan and bark houſes full of hides and bark, and great quantities of tobacco. A like deſtruction of ſtores and goods was made in other parts of Virginia.

From the account already given of ſome of the principal military operations of the preſent year in America, it appears, that though conſiderable advanta-

375 Unlucky miſunderſtanding between the Britiſh admiral and general. ges had been gained by the royal troops, yet no event had taken place from which it could rationally be expected that the final termination of the war would be favourable to Great Britain. It was alſo a diſadvantageous circumſtance, that there was a miſunderſtanding between Admiral Arbuthnot and Sir Henry Clinton, and a mutual diſapprobation of each other's conduct. This was manifeſt from their diſpatches to government, and eſpecially from thoſe of General Clinton, whoſe expreſſions reſpecting the conduct of the admiral were America. by no means equivocal.

376 Action between the Britiſh and French fleets off the capes of Virginia. On the 16th of March 1781, a partial action happened off the Capes of Virginia, between the fleet under Admiral Arbuthnot, conſiſting of ſeven ſhips of the line and one fifty-gun ſhip, and a French ſquadron, conſiſting of the ſame number of ſhips of the line and one forty-gun ſhip. Some of the ſhips in both fleets received conſiderable damage in the action, and the loſs of the Engliſh was 30 killed and 73 wounded; but no ſhip was taken on either ſide. The Britiſh fleet had, however, conſiderably the advantage; as the French were obliged to retire, and were ſuppoſed to be prevented by this action from carrying troops upon the Cheſapeak, in order to attack General Arnold and impede the progreſs of Lord Cornwallis. But it was an unfortunate circumſtance, that ſome time before this engagement the Romulus, a ſhip of 44 guns, was captured by the French off the Capes of Virginia.

Lord Cornwallis, after his victory over General Green at Guildford, proceeded, as we have ſeen, to

377 Proclamation by Lord Cornwallis. Wilmington, where he arrived on the 7th of April. But before he reached that place, he publiſhed a proclamation, calling upon all loyal ſubjects to ſtand forth and take an active part in reſtoring good order and government; and declaring to all perſons who had engaged in the preſent rebellion againſt his majeſty's authority, but who were now convinced of their error, and deſirous of returning to their duty and allegiance, that if they would ſurrender themſelves with their arms and ammunition at head-quarters, or to the officer commanding in the diſtrict contiguous to their reſpective places of reſidence, on or before the 20th of that month, they would be permitted to return to their homes upon giving a military parole; they would be protected, in their perſons and properties, from all ſorts of violence from the Britiſh troops; and would be reſtored, as ſoon as poſſible, to all the privileges of legal and conſtitutional government. But it does not appear that any conſiderable number of the Americans were allured by theſe promiſes to give any evidences of their attachment to the royal cauſe.

On the 20th of May, his Lordſhip arrived at Peterſburgh in Virginia, where he joined a body of Britiſh troops that had been under the command of Major-general Philips; but the command of which, in conſequence of the death of that officer, had devolved upon Brigadier-general Arnold. Before this junction he had encountered conſiderable inconveniences from the difficulty of procuring proviſions and forage; ſo that in a letter to Sir Henry Clinton, he informed him, that his cavalry wanted every thing, and his infantry every thing but ſhoes. He added, that he had experienced the diſtreſſes of marching hundreds of miles in a country chiefly hoſtile, without one active or uſeful friend, without intelligence, and without communication with any part of the country.

On the 26th of June, about ſix miles from Williamſburgh, Lieutenant-colonel Simcoe, and 350 of the

378 Different actions. queen's rangers, with 80 mounted yagers, were attacked by a much ſuperior body of the Americans; but whom they repulſed with great gallantry and with equal ſucceſs, making four officers and twenty private men priſoners. The loſs of the Americans in this action

America. tion is ſaid to have been upwards of 120, and that of the Britiſh troops not more than 40.

On the 6th of July an action happened near the Green Springs in Virginia, between a reconnoitring party of the Americans under General Wayne, amounting to about 800, and a large part of the Britiſh army under Lord Cornwallis; in which the Americans had 127 killed and wounded, and the loſs of the royal troops is ſuppoſed to have been conſiderably greater. It was an action in which no ſmall degree of military ſkill and courage was exhibited by the Americans. In a variety of ſkirmiſhes, the Marquis la Fayette very much diſtinguiſhed himſelf, and diſplayed the utmoſt ardour in the American cauſe.

379 General Greene defeated by Col. Stuart.

In South Carolina, an action happened on the 9th of September near the Eata Springs, between a large body of Britiſh troops under the command of Lieutenant-colonel Stuart and a much ſuperior body of Americans, ſaid to amount to more than 4000, under the command of General Greene. It was an obſtinate engagement, and laſted near two hours; but the Americans were defeated, and two of their ſix pounders fell into the hands of the Engliſh. The loſs, however, of the royal troops was very conſiderable; amounting to more than 400 killed and wounded, and upwards of 200 miſſing.

380 Expedition againſt New London.

In the courſe of the ſame month, General Arnold was ſent on an expedition againſt New London, in Connecticut, where he deſtroyed a great part of the ſhipping, and an immenſe quantity of naval ſtores, European manufactures, and Eaſt and Weſt India commodities. The town itſelf was alſo burnt, which is ſaid to have been unavoidable, on account of the exploſions of great quantities of gun-powder which happened to be in the ſtore-houſes that were ſet on fire. A fort, of which it was thought neceſſary to gain poſſeſſion in this expedition, was not taken without conſiderable loſs. This was fort Griſwold; which was defended by the Americans with great gallantry, and the aſſault was made by the Engliſh with equal bravery. The Britiſh troops entered the works with fixed bayonets, and were oppoſed with great vigour by the garriſon with long ſpears. After a moſt obſtinate defence of near forty minutes, the aſſailants gained poſſeſſion of the fort, in which 85 Americans were found dead, and 60 wounded, moſt of them mortally. Of the Britiſh troops Major Montgomery was killed by a ſpear in entering the American works; and 192 men were alſo killed and wounded in this expedition.

381 Critical ſituation of Lord Cornwallis.

Notwithſtanding the ſignal advantages that Lord Cornwallis had obtained over the Americans, his ſituation in Virginia began by degrees to be very critical; and the rather becauſe he did not receive thoſe reinforcements and ſupplies from Sir Henry Clinton, of which he had formed expectations, and which he conceived to be neceſſary to the ſucceſs of his operations. Indeed, the commander in chief was prevented from ſending thoſe reinforcements to Lord Cornwallis which he otherwiſe might have done, by his fears reſpecting New York, againſt which he entertained great apprehenſions that General Waſhington intended to make a very formidable attack. In fact, that able American general appears to have taken much pains, and to have employed great fineſſe, in order to lead Sir Henry Clinton to entertain this imagination. Letters, expreſſive of this intention, fell into the hands of Sir Henry, which were manifeſtly written with a deſign that they ſhould be intercepted, and only with a view to amuſe and deceive the Britiſh general. The project was ſucceſsful; and by a variety of judicious military manœuvres, in which he completely out-generalled the Britiſh commander, he increaſed his apprehenſions about New York, and prevented him from ſending proper aſſiſtance to Lord Cornwallis. Having for a conſiderable time kept Sir Henry Clinton in perpetual alarm in New York, though with an army much inferior to the garriſon of that city, General Waſhington ſuddenly quitted his camp at White Plains, croſſed the Delaware, and marched towards Virginia, apparently with a deſign to attack Lord Cornwallis. Sir Henry Clinton then received information, that the Count de Graſſe, with a large French fleet, was expected every moment in the Cheſapeak, in order to co-operate with General Waſhington. He immediately endeavoured, both by land and water, to communicate this information to Lord Cornwallis; and alſo ſent him aſſurances, that he would either reinforce him by every poſſible means in his power, or make the beſt diverſion he could in his favour. In the mean time, Lord Cornwallis had taken poſſeſſion of the poſts of York-town and Glouceſter in Virginia, where he fortified himſelf in the beſt manner he was able.

382 Ineffectual attempts to afford him aſſiſtance.

On the 28th of Auguſt, Sir Samuel Hood, with a ſquadron from the Weſt-Indies, joined the ſquadron under the command of Admiral Graves before New York. It was then neceſſary, on account of the ſituation of Lord Cornwallis, that they ſhould immediately proceed to the Cheſapeak; but ſome time appears to have been needleſsly loſt, though Admiral Hood was extremely anxious that no delay might be made. They arrived, however, in the Cheſapeak, on the 5th of September, with 19 ſhips of the line; where they found the Count de Graſſe, who had anchored in that bay on the 30th of Auguſt with 24 ſhips of the line. The French admiral had previouſly landed a large body of troops, which had been brought from Rhode Iſland, and who immediately marched to join the American army under General Waſhington. The Britiſh and French fleets came to an action on the ſame day in which the former arrived in the Cheſapeak. On board the Britiſh fleet 90 were killed and 246 wounded: ſome of the ſhips were greatly damaged in the engagement; and the Terrible, a 74 gun ſhip, was ſo much ſhattered, that it was afterwards found neceſſary to ſet fire to it. That this action had not been favourable to the Engliſh, was manifeſt from the event: the fleets continued in ſight of each other for five days ſucceſſively, and ſometimes were very near; but at length the French fleet all anchored within the Cape, ſo as to block up the paſſage. Admiral Graves, who was the commander in chief, then called a council of war, in which it was reſolved that the fleet ſhould proceed to New York, that the ſhips might be there put into the beſt ſtate for the ſervice: and thus were the French left maſters of the navigation of the Cheſapeak.

383 Action between the Britiſh and French fleets off the Cheſapeak.

Before the news of this action had reached New York, a council of war was held there, in which it was reſolved, that 5000 men ſhould be embarked on board the king's ſhips, in order to proceed to the aſſiſtance of Lord Cornwallis. But when it was known that the

French

French were abſolute maſters of the navigation of the Cheſapeak, it was thought inexpedient to ſend off that reinforcement immediately. In another council of war, it was reſolved, that as Lord Cornwallis had proviſions to laſt him till the end of October, it was adviſable to wait for more favourable accounts from Admiral Graves, or for the arrival of Admiral Digby, who was expected with three ſhips of the line. It was not then known at New York, that Admiral Graves had determined to return with the whole fleet to that port.

384 Danger of Lord Cornwallis increaſed.

In the mean time, the moſt effectual meaſures were adopted by General Waſhington for ſurrounding the Britiſh army under Lord Cornwallis. A large body of French troops under the command of Lieutenant-General the Count de Rochambeau, with a very conſiderable train of artillery, aſſiſted in the enterpriſe. The Americans amounted to near 8000 continentals and 5000 militia. General Waſhington was inveſted with the authority of commander in chief of theſe combined forces of America and France. On the 29th of September, the inveſtment of York Town was complete, and the Britiſh army quite blocked up. The day following, Sir Henry Clinton wrote a letter to Lord Cornwallis, containing aſſurances that he would do every thing in his power to relieve him, and ſome information concerning the ſteps that would be taken for that purpoſe. A duplicate of this letter was ſent to his Lordſhip by Major Cochran on the 3d of October. That gentleman, who was a very gallant officer, went in a veſſel to the Capes, and made his way to Lord Cornwallis, through the whole French fleet, in an open boat. He got to York Town on the 10th of the month; and ſoon after his arrival had his head carried off by a cannon ball.

After the return of Admiral Graves to New York, a council of war was held, conſiſting of flag and general officers; in which it was reſolved, that a large body of troops ſhould be embarked on board the king's ſhips as ſoon as they were refitted, and that the exertions of both fleet and army ſhould be made in order

385 Late arrival of General Clinton.

to form a junction with Lord Cornwallis. Sir Henry Clinton himſelf embarked on board the fleet, with upwards of 7000 troops, on the 18th; they arrived off Cape Charles, at the entrance of the Cheſapeak, on the 24th, where they received intelligence that Lord Cornwallis had been obliged to capitulate five days before.

386 Lord Cornwallis's army obliged to ſurrender.

It was on the 19th of October that Lord Cornwallis ſurrendered himſelf and his whole army, by capitulation, priſoners to the combined armies of America and France, under the command of General Waſhington. He made a defence ſuitable to the character he had before acquired, for courage and military ſkill; but was compelled to ſubmit to untoward circumſtances and ſuperior numbers. It was agreed by the articles of capitulation, that the Britiſh troops were to be priſoners to the United States of America, and the ſeamen to the French king, to whoſe officers alſo the Britiſh veſſels found at York Town and Glouceſter were to be delivered up. The Britiſh priſoners amounted to more than 6000; but many of them, at the time of ſurrender, were incapable of duty. A conſiderable number of cannon, and a large quantity of military ſtores, fell into the hands of the Americans on this occaſion.

As no rational expectation now remained of a ſubjugation of the colonies, the military operations that ſucceeded in America were of little conſequence. Some inconſiderable actions and ſkirmiſhes did indeed take place after that event; in which the refugees chiefly diſtinguiſhed themſelves, and diſcovered an inveterate animoſity againſt the Americans.

387 Sir Guy Carleton arrives at New York, with powers to treat of peace.

On the 5th of May 1782, Sir Guy Carleton arrived at New York, being appointed to the command of the Britiſh troops in America in the room of Sir Henry Clinton. Two days after his arrival, he wrote a letter to General Waſhington, acquainting him, that Admiral Digby was joined with himſelf in a commiſſion to treat of peace with the people of America; tranſmitting to him, at the ſame time, ſome papers tending to manifeſt the pacific diſpoſition of the government and people of Britain towards thoſe of America. He alſo deſired a paſſport for Mr Morgan, who was appointed to tranſmit a ſimilar letter of compliment to the congreſs. General Waſhington declined ſigning any paſſport till he had taken the opinion of congreſs upon that meaſure; and by them he was directed to refuſe any paſſport for ſuch a purpoſe. However, another letter was ſent to General Waſhington, dated the 2d of Auguſt, ſigned by Sir Guy Carleton and Rear-admiral Digby, in which they informed him, that they were acquainted by authority that negociations for a general peace had already commenced at Paris; that Mr Grenville was inveſted with full powers to treat with all the parties at war; and was then at Paris in the execution of his commiſſion. They farther informed him, that his Majeſty, in order to remove all obſtacles to that peace which he ſo ardently wiſhed to reſtore, had commanded his miniſters to direct Mr Grenville, that the independency of the thirteen provinces ſhould be propoſed by him, in the firſt inſtance, inſtead of making it the condition of a general treaty.

388 Reſolutions of congreſs in conſequence thereof.

But ſome jealouſies were entertained by the Americans, that it was the deſign of the Britiſh court either to diſunite them, or to bring them to treat of a peace ſeparately from their ally the king of France: they therefore reſolved, that any man, or body of men, who ſhould preſume to make any ſeparate or partial convention or agreement with the king of Great Britain, or with any commiſſioner or commiſſioners under the crown of Great Britain, ought to be conſidered and treated as open and avowed enemies of the United States of America; and alſo that thoſe ſtates could not with propriety hold any conference or treaty with any commiſſioners on the part of Great Britain, unleſs they ſhould, as a preliminary thereto, either withdraw their fleets and armies, or elſe, in poſitive or expreſs terms, acknowledge the independence of the ſaid ſtates. They likewiſe reſolved, that any propoſitions which might be made by the court of Great Britain, in any manner tending to violate the treaty ſubſiſting between them and the king of France, ought to be treated with every mark of indignity and contempt.

389 Different places evacuated by the king's troops.

In the month of June, the town of Savannah, and the whole province of Georgia, were evacuated by the king's troops; as was alſo Charleſtown, South Carolina, about the cloſe of the year. In the mean time, the negociations for peace being continued, proviſional articles of peace were ſigned at Paris on the 30th of November by the commiſſioner of his Britannic Ma-

jeſty and the American commiſſioners, in which his
390 Independency of America acknowledged. Majeſty acknowledged the united colonies of New Hampſhire, Maſſachuſets Bay, Rhode Iſland, and Providence Plantations, Connecticut, New York, New Jerſey, Penſylvania, Delaware, Maryland, Virginia, North Carolina, South Carolina, and Georgia, to be "free, ſovereign, and independent ſtates." They had conſtituted themſelves ſuch on the 4th of July 1776; they had been acknowledged ſuch by the French king on the 30th of January 1778, when he concluded with them a treaty of amity and commerce; Holland had acknowledged them as ſuch April 19th 1782; Sweden acknowledged them as ſuch February 5th 1783; Denmark the 25th February, Spain in March, and Ruſſia in July, the ſame year.

According to the report of the committee appointed for that purpoſe, *the Foreign Debt* of the United
391 Loſs of men and treaſure by the war. States incurred by the war, amounted to 7,885,085 dollars, and the *Domeſtic Debt* to 34,115,290, total at 4s. 6d. each, equal to 9,450,084 l. Sterling, the intereſt of which at 6 *per cent.* is 567,005 l. But the coſt to Great Britain is moderately computed at 115,654,914 l. and the additional annual burthen by it 4,557,575 l. ſince January 1775. As to the loſs of men during the unhappy war, the States of America, according to authentic eſtimates, loſt by the ſword and in priſon near 80,000 men; and by the Britiſh returns at New York, the number of ſoldiers killed in the ſervice amounted to 43,633.

392 General conſequences. Such was the end of the conteſt between Great Britain and America: A conteſt in which the latter attained to an independent rank among the nations, that may be productive of more important conſequences than can yet be foreſeen; and in which the former, happily for herſelf, was forced to relinquiſh a ſovereignty that ſerved only to repreſs her own internal induſtry, and retard her proſperity. She has, in the event, only ſuffered a diminution of unwieldy empire, which has been more than compenſated by an increaſe of population, commerce, revenues, and wealth.

393 Conſtitution of the American States. As to the general conſtitution of the American States:—By the acts of confederation and perpetual union, each of the colonies contracted a reciprocal treaty of alliance and friendſhip for their common defence, for the maintenance of their liberties, and for their general and mutual advantage; obliging themſelves to aſſiſt each other againſt all violence that might threaten all, or any one of them, and to repel in common all the attacks that might be levelled againſt all, or any one of them, on account of religion, ſovereignty, commerce, or under any other pretext whatſoever. Each of the colonies reſerved to themſelves alone the excluſive right of regulating their internal government, and of framing laws in all matters not included in the articles of confederation.—But for the more convenient management of the general intereſt of the United States, it was determined, that delegates ſhould be annually appointed in ſuch manner as the legiſlature of each ſtate ſhould direct, to meet in congreſs on the firſt Monday of November of every year, with a power reſerved to each ſtate to recal its delegates, or any of them, at any time within the year, and to ſend others in their ſtead for the remainder of the year. No ſtate is to be repreſented in congreſs by leſs than two, nor more than ſeven members; and no perſon is capable of being a delegate for more than three years, in any term of ſix years; nor is any perſon being a delegate, capable of holding any office under the United States, for which he, or any other for his benefit, ſhall receive any ſalary, fees, or emolument of any kind. In determining queſtions in the United States, in congreſs aſſembled, each ſtate is to have one vote. Every ſtate is to abide by the determinations of the United States in congreſs aſſembled, on all queſtions which are ſubmitted to them by the confederation. The articles of confederation are to be inviolably obſerved by every ſtate, and the union is to be perpetual; nor is any alteration, at any time hereafter, to be made in any of them, unleſs ſuch alteration be agreed to in a congreſs of the United States, and be afterwards confirmed by the legiſlature of every ſtate.

The ſtates have been ſince much employed in deliberations concerning the new-modelling of their government, in order to eſtabliſh ſuch a form as may be 394 Deliberations for new-modelling their government.
reſpected abroad, and prove ſalutary for domeſtic peace and ſecurity. But the ſeveral objects of their attention are ſo various and diffuſive, as to render it impoſſible to give even a ſummary view of the whole. They are deſirous to preſerve a republican or democrative government, yet in ſome meaſure ſimilar to the government from which they have ſeparated. As a parallel to our King, Lords, and Commons, it has been propoſed to have a Preſident, a Senate, and a Houſe of Repreſentatives; with this difference, that the Preſident and Senate are elective: The Preſident to be the grand executor of the laws: Foreign treaties already made, or which may hereafter be made, to be regarded as the ſupreme law of the land.

The whole territory of the United States contains by computation a million of ſquare miles, in which are 640 millions of acres. Of theſe, 51 millions are water; deducting which, the total amount of acres of land in the United States is 589 millions.

That part of the United States comprehended be- 395 Extent of their territory.
tween the weſt temporary line of Penſylvania on the eaſt, the boundary line between Britain and the United States extending from the river St Croix to the north-weſt extremity of the lake of the woods on the north, the river Miſſiſippi to the mouth of the Ohio on the weſt, and the river Ohio on the ſouth (the afore-mentioned bounds of Penſylvania), contains by computation about 411,000 ſquare miles, in which are 26,340,000 acres. Deduct for water 4,340,000 acres; there remains 220 millions of acres.

The whole of this immenſe extent of unappropriated weſtern territory, or vacant unſettled land, containing as above ſtated 220 millions of acres, has been by the ceſſion of ſome of the original ſtates, and by the treaty of peace, transferred to the fœderal government, and is pledged as a fund for ſinking the continental debt. It is in contemplation to divide it into new ſtates, with republican conſtitutions, ſimilar to the old ſtates near the Atlantic Ocean.

AMERICAN NIGHT-SHADE. See PHYTOLACCA.

AMERICAN GROUND-NUT. See ARRACHIS.

AMERICUS VESPUCIUS, a Florentine gentleman, from whom *America* derived its name.—The merchants of Seville having obtained permiſſion to attempt diſcoveries as private adventurers, ſent out four ſhips in in 1499, under the command of Alonzo de Ojeda (who

had accompanied Columbus in his second voyage), assisted by Americus Vespucius, who was known to be deeply skilled in the science of navigation. This fleet touched on that part of the western continent already discovered by Columbus, whose track Ojeda followed; and Americus, who was a man of much address, as well as possessed of considerable literary talents, by publishing the first voyages on the subject, and other artful means, gave his name to the New World, in prejudice to the illustrious Genoese. The imposture, though long detected, has been sanctified by time; and the fourth division of the globe, so long unknown to the inhabitants of Europe, Asia, and Africa, still continues to be distinguished by the name of America.

AMERSFORT, a city in the Netherlands, in the province of Utrecht, seated on the river Ems, E. Long. 5. 20. N. lat. 52. 14. The most remarkable things are, The town-house; the grand palace, which is triangular; the public walk, planted with trees; and the great church, dedicated to St George. The land to the east and south of this city is very fruitful; on the north there is nothing but pasture-ground, and on the west it is woody. Not far from hence is a mountain called *Amersfort-berg*, on which they have planted a vista of trees, which reaches to Utrecht.

AMERSHAM, or Agmondesham, a market-town in Buckinghamshire, consisting of about 200 houses, with a free-school, and four alms-houses. It sends two members to parliament, and has a market on Tuesday. It is a rectory rated at 48l. 16s. 8d. in the king's books. The market-house is a very handsome structure. W. long. 0. 15. N. lat. 51. 47.

AMES (William, D. D.) a learned independent divine, famous for his controversial writings, was born in 1576, and educated at Christ's college, in Cambridge. In the reign of King James I. he left the university, and soon after the kingdom, on account of his being unwilling to conform to the rules of the church; and retired to the Hague, where he had not been long before he was invited to accept of the divinity chair in the university of Franeker, in Friesland, which he filled with admirable abilities for above twelve years; during which his fame was so great, that many came from remote nations to be educated under him. He from thence removed to Rotterdam for a change of air, which his health demanded; and here he continued during the remainder of his life. His controversial writings, which compose the greatest part of his works, are chiefly against Bellarmine and the Arminians. He also wrote, 1. A fresh Suit against the Ceremonies. 2. *Lectiones in Psalmos Davidis*. 3. *Medulla Theologiæ;* and several pieces relative to the sciences. He died of an asthma, at Rotterdam, in Nov. 1633.

AMESTRATA, a town of Sicily, (Cicero); *Amestratos*, (Stephanus); *Amastra* (Silius Italicus); *Multistratos*, (Polybius): Now *Mistretta*, in the Val di Demona, on the river Halesus. It was a very strong fort of the Carthaginians, besieged in vain by the Romans for seven months with considerable loss; at length, after another siege, taken and rased, (Diodor. Siculus).

AMETHYST, a transparent gem of a purple colour, which seems composed of a strong blue and a deep red; and, according as either of those prevails, affording different tinges of purple, sometimes approaching to violet, and sometimes even fading to a pale-rose colour. Though the amethyst is generally of a purple colour, it is nevertheless sometimes found naturally colourless, and may at any time be easily made so by putting it into the fire; in which pellucid or colourless state, it so resembles the diamond, that its want of hardness seems the only way of distinguishing it. Some derive the name *amethyst* from its colour, which resembles wine mixed with water; whilst others, with more probability, think it got its name from its supposed virtue of preventing drunkenness; an opinion which, however imaginary, prevailed to that degree among the ancients, that it was usual for great drinkers to wear it about their necks. Be this as it will, the amethyst is scarce inferior to any of the gems in the beauty of its colour; and in its purest state is of the same hardness, and at least of equal value, with the ruby and sapphire. It is found of various sizes, from the bigness of a small vetch, to an inch and an half in diameter, and often to much more than that in length. Its shape is extremely various, sometimes roundish, sometimes oblong, and at others flatted, at least on one side; but its most common appearance is in a crystalliform figure, consisting of a thick column, composed of four plants, and terminated by a flat and short pyramid, of the same number of sides; or else, of a thinner and longer hexangular column; and sometimes of a long pyramid, without any column. It makes the gayest figure in the last of these states, but is hardest and most valuable in the roundish and pebble-like form. The amethyst is found in the East and West Indies, and in several parts of Europe; the oriental ones, at least some of the finer specimens, being so hard and bright as to equal any of the coloured gems in value. However, by far the greater number of amethysts fall infinitely short of these; as all the European ones, and not a few of those brought from the East and West Indies, are very little harder than common crystal.

Counterfeit or Factitious Amethyst. Spars and crystals tinged red and yellow, &c. are sold for amethysts. The false ones come from Germany, are tinged by vapours in the mines, and contain some lead.

Amethysts may be counterfeited by glass, to which the proper colour or stain is given. There were fine ones made in France about the year 1690, which may even impose on connoisseurs, unless the stone be taken out of the collet.—The method of giving this colour to glass is directed as follows: Take crystal-frit, made with the most perfect and fine tarso: Then prepare a mixture of manganese in powder, one pound; and zaffer prepared, one ounce and a half: Mix these powders well together; and add to every pound of the frit an ounce of this powder. Let it be put into the pots with the frit, not into the already made metal. When the whole has stood long enough in fusion to be perfectly pure, work it into vessels, and they will resemble the colour of the amethyst.

Amethyst, in heraldry, a term for the purple colour in the coat of a nobleman, in use with those who blazon with precious stones, instead of metals and colours. This, in a gentleman's escutcheon, is called *Purpure;* and in those of sovereign princes, *Mercury*.

AMETHYSTEA, amethyst: A genus of the monogynia order, belonging to the diandria class of plants; and, in the natural method, ranking under the 42d order, *Verticillatæ*. The characters are: The *calyx* consists of a single-leaved perianthium, bell-shaped, angular,

gular, femiquinquefid, and perfiftent: The *corolla* is monopetalous; the border quinquepartite, the loweft divifion more expanding: The *ftamina* confift of two flender filaments approximated; the antheræ are fimple and roundifh: The *piftillum* has a four-cleft germen; ftylus, the fize of the ftamina; ftigmata two, acute: No *corolla:* The *feeds* four, gibbous, and fhorter than the calyx:—There is only one known fpecies.

This plant is a native of Siberia, from whence the feeds were fent to the imperial garden at Peterfburgh, and thence brought to Britain. It is an annual plant, with an upright ftalk, which rifes about a foot high. Towards the top it puts forth two or three fmall lateral branches, garnifhed with fmall trifid leaves, fawed on their edges, of a very dark green colour. The flowers appear in June or July, and are produced in fmall umbels at the extremities of the branches. They are of a fine blue colour, as are alfo the upper part of the branches, and the leaves immediately under the umbel, fo that they make a fine appearance.

Culture. The feeds of the amethyftea fhould be fown in autumn, as they are apt to remain a whole year in the ground if kept till the fpring. When the plants come up, nothing elfe is neceffary than to keep them clear of weeds, and to thin them where they are too clofe. They ought to be fown where they are to remain, as they do not thrive when tranfplanted.

AMETHYSTINE is applied, in antiquity, to a kind of purple garment dyed of the hue of amethyft. In this fenfe amethyftine differed from *Tyrian* as well as from *hyacinthine* purple, being a kind of medium between both.

AMHAR, or AMHARA, a province of Abyffinia, faid to extend 40 leagues from eaft to weft. It is confidered as the moft noble in the whole empire, both on account of its being the ufual refidence of the Abyffinian monarchs, and having a particular dialect different from all the reft, which, by reafon of the emperors being brought up in this province, is become the language of the court and of the politer people. Here is the famed rock Amba-gefhen, where the young monarchs were formerly confined. See AMBA.

AMHURST (Nicholas), an Englifh poet and political writer, was born at Marden in Kent, and entered of St John's college Oxford; from whence he was expelled for irregularity of conduct and libertine principles. Retaining great refentment againft the univerfity on this account, he abufed its learning and difcipline, and fome of the moft refpectable characters in it, in a poem publifhed in 1724 called *Oculus Britanniæ*, and in a book intitled *Terræ Filius*. He publifhed, A Mifcellany of Poems, facred and profane; and, The Convocation, a poem in five cantos, which was a fatire on the Bifhop of Bangor's antagonifts. But he is beft known for the fhare he had in the political paper called *The Craftfman:* though, after having been the drudge of his party for near 20 years, he was as much forgot in the famous compromife of 1742 as if he had never been born; and, when he died in that year of a broken heart, was indebted to the charity of his bookfeller for a grave.

AMIANTHUS, or EARTH-FLAX, in natural hiftory, a fibrous, flexile, elaftic, mineral fubftance, confifting of fhort, abrupt, and interwoven filaments. It is found in Germany, in the ftrata of iron ore, fometimes forming veins of an inch in diameter. Its fibres are fo flexible that cloth has been made of them, and the fhorter filaments that feparate in the wafhing of the ftone may be made into paper in the common manner. For the method of its preparation for manufacture into cloth, fee ASBESTOS.

Amianthus is claffed by Mr Kirwan in the muriatic genus of earths, becaufe it contains about a fifth part of magnefia. Its other conftituents are, flint, mild calcareous earth, barytes, clay, and a very fmall proportion of iron. It is fufible *per fe* in a ftrong heat, and alfo with the common fluxes. It differs from afbeftos in containing fome ponderous earth.

AMICABLE, in a general fenfe, denotes any thing done in a friendly manner, or to promote peace.

AMICABLE Benches, in Roman antiquity, were, according to Pitifcus, lower and lefs honourable feats allotted for the *judices pedanei*, or inferior judges, who, upon being admitted of the emperor's council, were dignified by him with the title *amici*.

AMICABLE Numbers, fuch as are mutually equal to the fum of one another's aliquot parts. Thus the numbers 284 and 220 are amicable numbers: for the aliquot parts 1, 2, 4, 5, 10, 11, 20, 22, 44, 55, 110, of 220, are together equal to the other number 284; and the aliquot parts 1, 2, 4, 71, 142, of 284, are together equal to 220.

AMICTUS, in Roman antiquity, was any upper garment worn over the tunica.

AMICTUS, among ecclefiaftical writers, the uppermoft garment anciently worn by the clergy; the other five being the alba, fingulum, ftola, manipulus, and planeta. The amictus was a linen garment, of a fquare figure, covering the head, neck, and fhoulders, and buckled or clafped before the breaft. It is ftill worn by the religious abroad.

AMICULUM, in Roman antiquity, a woman's upper garment, which differed from the pala. It was worn both by matrons and courtezans.

AMICUS CURIÆ, a law-term, to denote a byftander who informs the court of a matter in law that is doubtful or miftaken.

AMIDA, a god worfhipped by the Japanefe, who has many temples erected to him in the ifland of Japan, of which the principal is at Jedo. The Japanefe have fuch a confidence in their idol Amida, that they hope to attain eternal felicity by the frequent invocation of his name. One of the figures of this idol is reprefented at Rome.

AMIDA (anc. geog.), a principal city of Mefopotamia (Liber Notitiæ); *Ammæa* (Ptolemy); fituated on a high mountain, on the borders of Affyria, on the Tigris, where it receives the Nymphius.—It was taken from the Romans, in the time of the emperor Conftans, by Sapores king of Perfia. The fiege is faid to have coft him 30,000 men; however, he reduced it to fuch ruin, that the emperor afterwards wept over it. According to Ammianus Marcellinus, the city was rafed; the chief officers were crucified; and the reft, with the foldiers and inhabitants, either put to the fword or carried into captivity, except our hiftorian himfelf, and two or three more, who, in the dead of the night, efcaped through a poftern unperceived by the enemy. The inhabitants of Nifibis, however, being obliged to leave their own city by Jovian's treaty with the

the Persians, soon restored Amida to its former strength; but it was again taken by Cavades in 501, but was restored to the Romans in 503. On the declension of the Roman power, it fell again into the hands of the Persians; but was taken from them by the Saracens in 899. It is now in the possession of the Turks. Here are above 20,000 Christians, who are better treated by the Turks than in other places. A great trade is carried on in this city, of red Turkey leather, and cotton cloth of the same colour. The Arabian name of Amida is *Diarbeker*, and the Turkish one *Kara-Amed*. E. Long. 39. 0. N. Lat. 36. 58.

AMIENS, a large handsome city of France, the capital of Picardy. It is agreeably situated on the river Somme, and said to have received its Latin name *Ambianum* from being every where encompassed with water. It is a place of great antiquity; being mentioned by Cæsar as a town that had made a vigorous resistance against the Romans, and where he convened a general assembly of the Gauls after having made himself master of it. The emperors Antoninus and Marcus Aurelius enlarged it; and Constantine, Constans, Julian, and several others, resided here a considerable time. The town is encompassed with a wall and other fortifications; and the ramparts are planted with trees, which form a delightful walk. The river Somme enters Amiens by three different channels, under as many bridges; and these channels, after washing the town in several places, where they are of use in its different manufactures, unite at the other end by the bridge of S. Michael. Here is a quay for the boats that come from Abbeville with goods brought by sea. At the gate of Noyon there is a suburb remarkable for the abbey of S. Achen. Next to this gate you come to that of Paris, where they have a long mall between two rows of trees. The houses are well built; the streets spacious, embellished with handsome squares and good buildings; and the number of inhabitants between 40 and 50 thousand. The cathedral, dedicated to our Lady, is one of the largest and most magnificent churches in France; adorned with handsome paintings, fine pillars, chapels, and tombs; particularly the nave is greatly admired. The other places worth seeing are the palace of the bailiwic, the town-house, the square *des Fleurs*, and the great market-place.

Amiens was taken by the Spaniards, in 1597, by the following stratagem: Soldiers, disguised like peasants, conducted a cart laden with nuts, and let a bag of them fall just as the gate was opened. While the guard was busy in gathering up the nuts, the Spaniards entered and became masters of the town. It was retaken by Henry IV. who built a citadel here.

This town is the seat of a bishop, suffragan of Rheims, as also of a presidial, bailiwic, vidam, a chamber of accounts, and a generality. The bishop's revenue is 30,000 livres. They have some linen and woollen manufactures, and they also make a great quantity of black and green soap. It lies in E. Long. 2. 30. N. Lat. 49. 50.

AMILCAR, the name of several Carthaginian captains. The most celebrated of them is Amilcar Barcas, the father of Hannibal, who during five years infested the coast of Italy; when the Romans sending out their whole naval strength, defeated him near Trapani, 242 years before Christ; and this put an end to the first Punic war. Amilcar began the second, and landed in Spain, where he subdued the most warlike nations; but as he was preparing for an expedition against Italy, he was killed in battle, 228 years before the Christian æra. He left three sons, whom he had educated, as he said, like three lions, to tear Rome in pieces; and made Hannibal, his eldest son, swear an eternal enmity against the Romans.

AMILICTI, in the Chaldaic theology, denote a kind of intellectual powers, or persons in the divine hierarchy.—The amilicti are represented as three in number; and constitute one of the tryads, in the third order of the hierarchy.

AMIRANTE, in the Spanish polity, a great officer of state, answering to our lord high-admiral.

AMISUS, the chief city of the ancient kingdom of Pontus. It was built by the Milesians, and peopled partly by them, and partly by a colony from Athens. It was at first a free city, like the other Greek cities in Asia; but afterwards subdued by Pharnaces king of Pontus, who made it his metropolis. It was taken by Lucullus in the Mithridatic war, who restored it to its ancient liberty. Close by Amisus stood another city called *Eupatoria*, from Mithridates Eupator its founder. This city was likewise taken by Lucullus, who levelled it with the ground; but it was afterwards rebuilt by Pompey, who united it with Amisus, giving them the name of *Pompeiopolis*. It was taken during the war between Cæsar and Pompey, by Pharnaces king of Pontus, who put most of its inhabitants to the sword; but Cæsar, having conquered Pharnaces, made it again a free city.

AMITERNUM, a town of the Sabines, in Italy, (Livy, Pliny); now extinct: The ruins are to be seen on the level ridge of a mountain, near S. Vittorino, and the springs of the Aternus; not far from Aquila, which rose out of the ruins of Amiternum.

AMITTERE LEGEM TERRÆ, among lawyers, a phrase importing the loss of liberty of swearing in any court: The punishment of a champion overcome or yielding in battle, of jurors found guilty in a writ of attaint, and of a person outlawed.

AM-KAS, in history, a name given to a spacious saloon in the palace of the Great Mogul, where he gives audience to his subjects, and where he appears on solemn festivals with extraordinary magnificence. His throne is supported by six large steps of massy gold, set with rubies, emeralds, and diamonds, estimated at 60,000,000 l.

AMMA, among ecclesiastical writers, a term used to denote an abbess or spiritual mother.

AMMAN, or AMMANT, in the German and Belgic policy, a judge who has the cognisance of civil causes. —It is also used among the French for a public notary, or officer, who draws up instruments and deeds.

AMMANIA: A genus of the monogynia order, belonging to the tetrandria class of plants; and in the natural method ranking under the 17th order, *Calycanthemæ*. The characters are: The *calyx* is an oblong, erect, bell-shaped perianthium, with eight striæ, quadrangulated, octodentated, and persistent: The *corolla* is either wanting, or it consists of four ovate expanding petals inserted in the calyx: The *stamina* consist of four bristly filaments the length of the calyx; the antheræ

theræ are didymous: The *piſtillum* has a large ovate germen, above; the ſtylus ſimple and very ſhort, the ſtigma headed: The *pericarpium* is a roundiſh four-celled capſule, covered by the calyx: The *ſeeds* are numerous and ſmall.—Of this genus there are three ſpecies enumerated; all of them natives of warm climates. They have no beauty or other remarkable property.

AMMI, BISHOP'S WEED: A genus of the digynia order, belonging to the pentandria claſs of plants; and ranking, in the natural method, under the 45th order, *Umbellatæ*. The characters are: Of the *calyx* the univerſal umbel is manifold; the partial one ſhort and crowded; the involucra are pinnatifid, with numerous leaflets: The *corollæ* are radiated, and all hermaphrodite: The *ſtamina* conſiſt of five capillary filaments; the antheræ roundiſh: The *piſtillum* has a germen beneath: the ſtyli are two, and reflected; and the ſtigmata are obtuſe: There is no *pericarpium*; the fruit is roundiſh, poliſhed, ſtriated, ſmall, and partible: The *ſeeds* are two, plano-convex, and ſtriated. Of this there are three

Species. 1. The majus, or common biſhop's-weed, the ſeeds of which are uſed in medicine. 2. The glaucifolium, with all its leaves cut in the ſhape of a ſpear. 3. The copticum, or Egyptian biſhop's-weed.

Culture, &c. The firſt is an annual plant; and therefore is to be propagated by ſeeds ſown in the autumn, in the place where the plants are to remain. They will flower in June, and the ſeeds will ripen in Auguſt. This plant will grow in any open ſituation, but thrives beſt in a light ſandy ſoil. The ſecond ſort is perennial, and very hardy. It thrives beſt in a moiſt ſoil, and may be propagated by ſeeds in the ſame manner as the former.

The third ſpecies is now no otherwiſe known than by the figure of its ſeeds, which were formerly uſed in medicine, but have long ſince given place to thoſe of the common kind. The ſeeds of the ammi copticum are ſmall, ſtriated, of a reddiſh brown colour, and have a warm pungent taſte, and a pleaſant ſmell approaching to that of origanum. They are recommended as ſtomachic, carminative, and diuretic; but have long been ſtrangers to the ſhops. The ſeeds of the ammi majus, which are uſed in their place, are much weaker both in taſte and ſmell, and without the origanum flavour of the other.

AMMIANUS (Marcellinus), a Grecian and a ſoldier as he calls himſelf, was born at Antioch, and flouriſhed under Conſtantius and the preceding emperors as late as Theodoſius. He ſerved under Julian in the eaſt; and wrote in Latin an intereſting hiſtory, from the reign of Nerva to the death of Valens, in 31 books; of which only 18 remain. Though a Pagan, he ſpeaks with candour and moderation of the Chriſtian religion, and even praiſes it: his hero is the emperor Julian. He died about the year 390. The beſt edition of his hiſtory is that of Gronovius, in 1693.

AMMIRATO (Scipio), an eminent Italian hiſtorian, born at Lecca in Naples in 1531. After travelling over great part of Italy, without ſettling to his ſatisfaction, he was engaged by the great duke of Tuſcany to write *The Hiſtory of Florence*; for which he was preſented to a canonry in the cathedral there. He wrote other works while in this ſtation; and died in 1600.

AMMOCHRYSOS, from αμμος, *ſand*, and χρυσος, *gold*, a name given by authors to a ſtone very common in Germany, and ſeeming to be compoſed of a golden ſand. It is of a yellow gold-like colour, and its particles are very gloſſy, being all fragments of a coloured talc. It is uſually ſo ſoft as to be eaſily rubbed to a powder in the hand; ſometimes it requires grinding to powder in a mortar, or otherwiſe. It is uſed only as ſand to ſtrew over writing. The Germans call it *katzengold*. There is another kind of it leſs common, but much more beautiful, conſiſting of the ſame ſort of gloſſy ſpangles, but thoſe not of a gold colour, but of a bright red, like vermillion.

AMMODYTES, or SAND-EEL, in ichthyology, a genus of fiſhes belonging to the order of apodes. This fiſh reſembles an eel, and ſeldom exceeds a foot in length. The head of the ammodytes is compreſſed, and narrower than the body; the upper jaw is larger than the under; the body is cylindrical, with ſcales hardly perceptible. There is but one ſpecies of the ammodytes, viz. the tobianus, or launce, a native of Europe. This fiſh gathers itſelf into a circle, and pierces the ſand with its head in the centre. It is found in moſt of our ſandy ſhores during ſome of the ſummer-months: it conceals itſelf, on the receſs of the tides, beneath the ſand, in ſuch places where the water is left, at the depth of about a foot; and is in ſome places dug out, in others drawn up by means of a hook contrived for that purpoſe. They are commonly uſed as baits for other fiſh, but they are alſo very delicate eating. Theſe fiſh are found in the ſtomach of the *Porpeſs*; an argument that the laſt roots up the ſand with its noſe, as hogs do the ground.

AMMON, anciently a city of Marmarica, (Ptolemy). Arrian calls it a *place*, not a city, in which ſtood the temple of Jupiter Ammon, round which there was nothing but ſandy waſtes. Pliny ſays, That the oracle of Ammon was 12 days journey from Memphis, and among the *Nomi* of Egypt he reckons the *Nomos Ammoniacus*: Diodorus Siculus, That the diſtrict where the temple ſtood, though ſurrounded with deſarts, was watered by dews which fell nowhere elſe in all that country. It was agreeably adorned with fruitful trees and ſprings, and full of villages. In the middle ſtood the acropolis or citadel, encompaſſed with a triple wall; the firſt and inmoſt of which contained the palace; the others the apartments of the women, the relations and children, as alſo the temple of the god, and the ſacred fountain for luſtrations. Without the acropolis ſtood, at no great diſtance, another temple of Ammon, ſhaded by a number of tall trees: near which there was a fountain, called that of the ſun, or *Solis Fons*, becauſe ſubject to extraordinary changes according to the time of the day; morning and evening warm, at noon cold, at midnight extremely hot. A kind of foſſil ſalt was ſaid to be naturally produced here. It was dug out of the earth in large oblong pieces, ſometimes three fingers in length, and tranſparent as cryſtal. It was thought to be a preſent worthy of kings, and uſed by the Egyptians in their ſacrifices.—From this our ſal ammoniac has taken its name.

AMMON, or HAMMON, in heathen mythology, the name of the Egyptian Jupiter, worſhipped under the figure of a ram.

Bacchus having ſubdued Aſia, and paſſing with his army

army through the defarts of Africa, was in great want of water: but Jupiter, his father, affuming the fhape of a ram, led him to a fountain, where he refrefhed himfelf and his army; in gratitude for which favour, Bacchus built there a temple to Jupiter, under the title of *Ammon*, from the Greek ἀμμος, which fignifies *fand*, alluding to the fandy defart where it was built. In this temple was an oracle of great note, which Alexander the Great confulted, and which lafted till the time of Theodofius.

Hammon, the god of the Egyptians, was the fame with the Jupiter of the Greeks; for which reafon thefe latter denominate the city which the Egyptians call No-Hammon or the habitation of Ammon, *Diofpolis* or the city of Jupiter. He is thought to be the fame with Ham, who peopled Africa, and was the father of Mizraim, the founder of the Egyptians.

Ammon, or Ben-Ammi, the fon of Lot, begot by this patriarch upon his youngeft daughter (Gen. xix. 38.) He was the father of the Ammonites, and dwelt to the eaft of the Dead Sea, in the mountains of Gilead. See Ammonitis and Ammonites.

Ammon (Andreas), an excellent Latin poet, born at Lucca in Italy, was fent by Pope Leo X. to England, in the characters of prothonotary of the Apoftolic See, and collector-general of this kingdom. Being a man of fingular genius and learning, he foon became acquainted with the principal literati of thofe times; particularly with Erafmus, Colet, Grocin, and others, for the fake of whofe company he refided fome time at Oxford. The advice which Erafmus gives him, in regard to pufhing his fortune, has a good deal of humour in it, and was certainly intended as a fatire on the artful methods generally practifed by the felfifh and ambitious part of mankind: "In the firft place (fays he), throw off all fenfe of fhame; thruft yourfelf into every one's bufinefs, and elbow out whomfoever you can; neither love nor hate any one; meafure every thing by your own advantage; let this be the fcope and drift of all your actions. Give nothing but what is to be returned with ufury, and be complaifant to every body. Have always two ftrings to your bow. Feign that you are folicited by many from abroad, and get every thing ready for your departure. Show letters inviting you elfewhere, with great promifes." Ammon was Latin fecretary to Henry VIII. but at what time he was appointed does not appear. In 1512 he was made canon and prebendary of the collegiate chapel of St Stephen, in the palace of Weftminfter. He was likewife prebendary of Wells; and in 1514 was prefented to the rectory of Dychial in that diocefe. About the fame time, by the king's fpecial recommendation, he was alfo made prebendary of Salifbury. He died in the year 1517, and was buried in St Stephen's chapel in the palace of Weftminfter. He was efteemed an elegant Latin writer, and an admirable poet. The epiftles of Erafmus to Ammon abound with encomiums on his genius and learning.—His works are, 1. *Epiftolæ ad Erafmum*, lib. i. 2. *Scotici conflictus hiftoria*, lib. i. 3. *Bucolicæ vel eclogæ* lib. i. Bafil 1546, 8vo. 4. *De rebus nihil*, lib. i. 5. *Panegyricus quidam*, lib. i. 6. *Varii generis epigrammata*, lib. i. 7. *Poemata diverfa*, lib. i.

AMMONIAC, a concrete gummy refinous juice, brought from the Eaft Indies, ufually in large maffes, compofed of little lumps or tears, of a milky colour, but foon changing, upon being expofed to the air, of a yellowifh hue. We have no certain account of the plant which affords this juice; the feeds ufually found among the tears refemble thofe of the umbelliferous clafs. It has been, however, alleged, and not without fome degree of probability, that it is an exudation from a fpecies of the ferula, another fpecies of which produces the afafœtida. The plant producing it is faid to grow in Nubia, Abyffinia, and the interior parts of Egypt. It is brought to the weftern part of Europe from Egypt, and to England from the Red Sea, by fome of the fhips belonging to the Eaft India Company trading to thofe parts. Such tears as are large, dry, free from little ftones, feeds, or other impurities, fhould be picked out, and preferred for internal ufe; the coarfer kind is purified by folution and colature, and then carefully infpiffating it; unlefs this be artfully managed, the gum will lofe a confiderable deal of its more volatile parts. There is often vended in the fhops, under the name of ftrained gum ammoniacum, a compofition of ingredients much inferior in virtue.

Ammoniac has a naufeous fweet tafte, followed by a bitter one; and a peculiar fmell, fomewhat like that of galbanum, but more grateful: it foftens in the mouth, and grows of a whiter colour upon being chewed. Thrown upon live coals, it burns away in flame: it is in fome meafure foluble in water and in vinegar, with which it affumes the appearance of milk; but the refinous part, amounting to about one half, fubfides on ftanding.

Ammoniac is an ufeful deobftruent, and frequently prefcribed for opening obftructions of the abdominal vifcera, and in hyfterical diforders occafioned by a deficiency of the menftrual evacuations. It is likewife fuppofed to deterge the pulmonary veffels; and proves of confiderable fervice in fome kinds of afthmas, where the lungs are oppreffed by vifcid phlegm: in this intention, a folution of gum ammoniac in vinegar of fquills proves a medicine of great efficacy, though not a little unpleafant. In long and obftinate cholics proceeding from vifcid matter lodged in the inteftines, this gummy refin has produced happy effects, after the purges and the common carminatives had been ufed in vain. Ammoniac is moft commodioufly taken in the form of pills; about a fcruple may be given every night, or oftener. Externally, it foftens and ripens hard tumours: a folution of it in vinegar ftands recommended by fome for refolving even fchirrhous fwellings. A plafter made of it and fquill-vinegar is recommended by fome in white fwellings. A dilute mixture of the fame is likewife rubbed on the parts, which are alfo fumigated with the fmoke of juniper-berries. In the fhops is prepared a folution of it in pennyroyal water, called from its milky colour, *lac ammoniaci*. It is an ingredient alfo in the fquill pills.

Sal Ammoniac, a volatile falt, of which there are two kinds, ancient and modern. The ancient fort, defcribed by Pliny and Diofcorides, was a native falt, generated in thofe large inns or caravanferas where the crowd of pilgrims, coming from the temple of Jupiter Ammon, ufed to lodge; who, in thofe parts, traveling upon camels, and thofe creatures when in Cyrene, a province of Egypt, where that celebrated temple ftood,

ſtood, urining in the ſtables, or (ſay ſome) in the parched ſands, out of this urine, which is remarkably ſtrong, aroſe a kind of ſalt, denominated ſometimes (from the temple) *Ammoniac*, and ſometimes (from the country) *Cyreniac*. Since the ceſſation of theſe pilgrimages, no more of this ſalt is produced there; and, from this deficiency, ſome ſuſpect there never was any ſuch thing: But this ſuſpicion is removed, by the large quantities of a ſalt, nearly of the ſame nature, thrown out by mount Ætna. The characters of the ancient ſal ammoniac are, that it cools water, turns aqua fortis into aqua regia, and conſequently diſſolves gold.

The modern ſal ammoniac is entirely factitious: for which, ſee CHEMISTRY-*Index*.

AMMONIAN PHILOSOPHY. See AMMONIUS.

AMMONITÆ, in natural hiſtory. See *CORNU Ammonis*.

AMMONITES, a people deſcended from Ammon the ſon of Lot. The Ammonites deſtroyed thoſe giants which they called Zamzummims (Deut. ii. 19—21.), and ſeized upon their country. God forbad Moſes, and by him the children of Iſrael (*id.* 19.), to attack the Ammonites; becauſe he did not intend to give their lands unto the Hebrews. Before the Iſraelites entered the land of Canaan, the Amorites had by conqueſt got great part of the countries belonging to the Ammonites and Moabites. This Moſes retook from the Amorites, and divided between the tribes of Gad and Reuben. In the time of Jephtha, the Ammonites declared war againſt the Iſraelites (Judges xi.), under pretence that they detained a great part of the country which had formerly been theirs before the Amorites poſſeſſed it. Jephtha declared, that as this was an acquiſition which the Iſraelites had made in a juſt war, and what they had taken from the Amorites, who had long enjoyed it by right of conqueſt, he was under no obligation to reſtore it. The Ammonites were not ſatisfied with this reaſon; wherefore Jephtha gave them battle and defeated them. The Ammonites and Moabites generally united whenever there was any deſign ſet a-foot of attacking the Iſraelites. After the death of Othniel (*id.* iii.), the Ammonites and Amalekites joined with Eglon king of Moab to oppreſs the Hebrews; whom they ſubdued, and governed for the ſpace of 18 years, till they were delivered by Ehud the ſon of Gera, who ſlew Eglon king of Moab. Some time after this, the Ammonites made war againſt the Iſraelites, and greatly diſtreſſed them. But theſe were at laſt delivered by the hands of Jephtha; who having attacked the Ammonites, made a very great ſlaughter among them (chap. xi.). In the beginning of Saul's reign (1 Sam. xi.), Naaſh king of the Ammonites having ſat down before Jabeſh-gilead, reduced the inhabitants to the extremity of demanding a capitulation. Naaſh anſwered, that he would capitulate with them upon no other conditions than their ſubmitting to have every one his right eye plucked out, that ſo they might be made a reproach to Iſrael: but Saul coming ſeaſonably to the relief of Jabeſh, delivered the city and people from the barbarity of the king of the Ammonites. David had been the king of Ammon's friend; and after the death of this prince, he ſent ambaſſadors to make his compliments of condolence to Hanun his ſon and ſucceſſor; who, imagining that David's ambaſſadors were come as ſpies to obſerve his ſtrength, and the condition of his kingdom, treated them in a very injurious manner (2 Sam. x. 4.). David revenged this indignity thrown upon his ambaſſadors, by ſubduing the Ammonites, the Moabites, and the Syrians their allies. Ammon and Moab continued under the obedience of the kings David and Solomon; and, after the ſeparation of the ten tribes, were ſubject to the kings of Iſrael till the death of Ahab in the year of the world 3107. Two years after the death of Ahab, Jehoram his ſon, and ſucceſſor of Ahaziah, defeated the Moabites (2 Kings iii.): but it does not appear that this victory was ſo complete as to reduce them to his obedience. At the ſame time, the Ammonites, Moabites, and other people, made an irruption upon the lands belonging to Judah; but were forced back and routed by Jehoſhaphat (2 Chr. xx. 1, 2.). After the tribes of Reuben, Gad, and the half-tribe of Manaſſeh, were carried into captivity by Tiglath-pileſer in the year 3264, the Ammonites and Moabites took poſſeſſion of the cities belonging to theſe tribes. Jeremiah (xlix. 1.) reproaches them for it. The ambaſſadors of the Ammonites were ſome of thoſe to whom this prophet (chap. xxvii. 2.—4.) preſented the cup of the Lord's fury, and directed to make bonds and yokes for themſelves; exhorting them to ſubmit themſelves to Nebuchadnezzar, and threatening them, if they did not, with captivity and ſlavery. Ezekiel (xxv. 4.—10.) denounces their entire deſtruction; and tells them that God would give them up to the people of the eaſt, who ſhould ſet their palaces in their country, ſo that there ſhould be no more mention of the Ammonites among the nations. It is believed that theſe misfortunes happened to the Ammonites in the fifth year after the taking of Jeruſalem, when Nebuchadnezzar made war againſt all the people that dwelt upon the confines of Judea, in the year of the world 3420.

It is alſo thought probable, that Cyrus gave the Ammonites and Moabites the liberty of returning into their own country, from whence they had been removed by Nebuchadnezzar: for we ſee them, in the place of their former ſettlement, expoſed to thoſe revolutions which were common to the people of Syria and Paleſtine; ſubject ſometimes to the kings of Egypt, and at other times to the kings of Syria. We are told by Polybius, that Antiochus the Great took Rabboth, or Philadelphia, their capital, demoliſhed the walls, and put a garriſon in it in 3806. During the perſecutions of Antiochus Epiphanes, Joſephus informs, that the Ammonites ſhowed their hatred to the Jews, and exerciſed great cruelties againſt ſuch of them as lived about their country. Juſtin Martyr ſays, That in his time there were ſtill many Ammonites remaining; but Origen aſſures us, that when he was living they were known only under the general name of Arabians. Thus was the prediction of Ezekiel (xxv. 10.) accompliſhed; who ſaid that the Ammonites ſhould be deſtroyed in ſuch a manner as not to be remembered among the nations.

AMMONITIS (anc. geog.), a country of Arabia Petræa, occupied by the children of Ammon, whence the appellation. Its limits partly to the weſt and partly to the north were the river Jabbok, whoſe courſe is

no where determined; though Josephus says, that it runs between Rabbath-Ammon, or Philadelphia, and Gerasa, and falls into the Jordan.

AMMONIUS, surnamed SACCAS, was born in Alexandria, and flourished about the beginning of the third century. He was one of the most celebrated philosophers of his age; and, adopting with alterations the Ecclectic philosophy, laid the foundations of that sect which was distinguished by the name of the *New Platonics*. See ECCLECTICS and PLATONISM.

This learned man was born of Christian parents, and educated in their religion; the outward profession of which, it is said, he never entirely deserted. As his genius was vast and comprehensive, so were his projects bold and singular: For he attempted a general coalition of all sects, whether philosophical or religious, by framing a system of doctrines which he imagined calculated to unite them all, the Christians not excepted, in the most perfect harmony. In pursuance of this design, he maintained, that the great principles of all philosophical and religious truth were to be found equally in all sects; that they differed from each other only in their method of expressing them, and in some opinions of little or no importance; and that, by a proper interpretation of their respective sentiments, they might easily be united into one body. Accordingly, all the Gentile religions, and even the Christian, were to be illustrated and explained by the principles of this universal philosophy; and the fables of the priests were to be removed from Paganism, and the comments and interpretations of the disciples of Jesus from Christianity. In conformity to this plan, he insisted, that all the religious systems of all nations should be restored to their original purity, and reduced to their primitive standard, viz. the ancient philosophy of the East, preserved uncorrupted by Plato: and he affirmed, that this project was agreeable to the intentions of Jesus Christ; whose sole view in descending upon earth was to set bounds to the reigning superstition, to remove the errors that had blended themselves with the religions of all nations, but not to abolish the ancient theology from which they were derived. He therefore adopted the doctrines which were received in Egypt concerning the universe and the Deity, considered as constituting one great whole; concerning the eternity of the world, the nature of souls, the empire of Providence, and the government of the world by dæmons. He also established a system of moral discipline; which allowed the people in general to live according to the laws of their country and the dictates of nature; but required the wise to exalt their minds by contemplation, and to mortify the body, so that they might be capable of enjoying the presence and assistance of the dæmons, and of ascending after death to the presence of the Supreme Parent. In order to reconcile the popular religions, and particularly the Christian, with this new system, he made the whole history of the Heathen gods an allegory; maintaining that they were only celestial ministers, intitled to an inferior kind of worship. And he acknowledged that Jesus Christ was an excellent man, and the friend of God; but alleged that it was not his design entirely to abolish the worship of dæmons, and that his only intention was to purify the ancient religion. This system, so plausible in its first rise, but so comprehensive and complying in its progress, has been the source of innumerable errors and corruptions in the Christian church. At its first establishment it is said to have had the approbation of Athenagoras, Pantænus, and Clemens the Alexandrian, and of all who had the care of the public school belonging to the Christians at Alexandria. It was afterwards adopted by Longinus the celebrated author of the treatise on the Sublime, Plotinus, Herennius, Origen, Porphyry, Jamblichus the disciple of Porphyry, Sopater, Edisius, Eustathius, Maximus of Ephesus, Priscus, Chrysanthius the master of Julian, Julian the Apostate, Hierocles, Proclus, and many others both Pagans and Christians.

The above opinions of Ammonius are collected from the writings and disputations of his disciples the modern Platonics: for he himself left nothing in writing behind him; nay, he imposed a law upon his disciples not to divulge his doctrines among the multitude; which injunction, however, they made no scruple to neglect and violate.

AMMONIUS, surnamed LITHOTOME, a celebrated surgeon of Alexandria; so called from his inventing the operation of extracting the stone from the bladder.

AMMUNITION, a general name for all warlike provisions; but more particularly powder, ball, &c.

Ammunition, arms, utensils of war, gun-powder, imported without licence from his Majesty, are, by the laws of England, forfeited, and triple the value. And again, such licence obtained, except for furnishing his Majesty's public stores, is to be void, and the offender to incur a premunire, and to be disabled to hold any office from the crown.

AMMUNITION Bread, Shoes, &c, such as are served out to the soldiers of an army or garrison.

AMNESTY, in matters of policy, denotes a pardon granted by a prince to his rebellious subjects, usually with some exceptions: such was that granted by Charles II. at his restoration.—The word is formed from the Greek αμνεστια, the name of an edict of this kind published by Thrasibulus, on his expulsion of the tyrants out of Athens.

AMNIOS, in anatomy, a thin pellucid membrane which surrounds the fœtus in the womb. See FOETUS.

AMOEBÆUM, in ancient poetry, a kind of poem representing a dispute between two persons, who are made to answer each other alternately: such are the third and seventh of Virgil's eclogues.

AMOL, a town of Asia, in the country of the Usbecks, seated on the river Gihon. E. Long. 64. 30. N. Lat. 39. 20.

AMOMUM, GINGER: A genus of the monogynia order, belonging to the monandria class of plants. The characters are: The *calyx* is an obscure three-toothed perianthium, above: The *corolla* is monopetalous, the tubus short, the limbus tripartite: The *stamina* is an oblong filament, with the anthera adjoining: The *pistillum* has a roundish germen, beneath; the stylus is filiform, the stigma obtuse: The *pericarpium* is leathery, subovate, trigonous, trilocular, and three-valved: The *seeds* are numerous.—Of this genus there are four

Species. 1. The zingiber, or common ginger, is a native of the East, and also of some parts of the West

Indies;

Indies; where it grows naturally without culture. The roots are jointed, and ſpread in the ground: they put out many green reed-like ſtalks in the ſpring, which ariſe to the height of two feet and an half, with narrow leaves. The flower-ſtems ariſe by the ſide of theſe, immediately from the root; theſe are naked; ending with an oblong ſcaly ſpike. From each of theſe ſcales is produced a ſingle blue flower, whoſe petals are but little lower than the ſquamous covering. 2. The zerumbet, or wild ginger, is a native of India. The roots are larger than thoſe of the firſt, but are jointed in the ſame manner. The ſtalks grow from three to near four feet high, with oblong leaves placed alternately. The flower-ſtems ariſe immediately from the root: theſe are terminated by oblong, blunt, ſcaly heads; out of each ſcale is produced a ſingle white flower, whoſe petals extend a conſiderable length beyond the ſcaly covering. 3. The cardamomum, or cardamom, is likewiſe a native of India; but is little known in this country except by its ſeeds, which are uſed in medicine. Of this there is a variety, with ſmaller fruit, which makes the diſtinction into cardamomum majus and minus. The firſt, when it comes to us, is a dried fruit or pod about an inch long, containing, under a thick ſkin, two rows of ſmall triangular ſeeds of a warm aromatic flavour. The cardamomum minus is a fruit ſcarce half the length of the foregoing, but conſiderably ſtronger both in ſmell and taſte. 4. The grana paradiſi ſpecies is likewiſe a native of the Eaſt Indies. The fruit containing the grains of paradiſe is about the ſize of a fig, divided into three cells, in each of which are contained two roots of ſmall ſeeds like cardamoms. They are ſomewhat more grateful, and conſiderably more pungent, than cardamoms.

Culture. The firſt two ſpecies are tender, and require a warm ſtove to preſerve them in this country. They are eaſily propagated by parting the roots in the ſpring. Theſe ſhould be planted in pots filled with light rich earth, and plunged into a hot-bed of tanner's-bark, where they muſt conſtantly remain. Cardamoms and grains of paradiſe are not cultivated in this country. If we may believe the Abbé Raynal, the former propagate themſelves, in thoſe countries where they are natives, without either ſowing or planting. Nothing more is required than, as ſoon as the rainy ſeaſon is over, to ſet fire to the herb which has produced the fruit.

Uſes. The dried roots of the firſt ſpecies are of great uſe in the kitchen, as well as in medicine. They furniſh a conſiderable export from ſome of the American iſlands. The green roots, preſerved as a ſweet-meat, are preferable to every other kind. The Indians mix them with their rice, which is their common food, to correct its natural inſipidity. This ſpice, mixed with others, gives the diſhes ſeaſoned with it a ſtrong taſte, which is extremely diſagreeable to ſtrangers. The Europeans, however, who come into Aſia without fortunes, are obliged to conform to it. The others adopt it out of complaiſance to their wives, who are generally natives of the country.—Ginger is a very uſeful ſpice, in cold flatulent colics, and in laxity and debility of the inteſtines; it does not heat ſo much as thoſe of the pepper kind, but its effects are much more durable. The cardamoms and grains of paradiſe have the ſame medicinal qualities with ginger.—In Jamaica, the common people employ it in baths and fomentations with good ſucceſs, in complaints of the viſcera, in pleuriſies, and in obſtinate and continued fevers.

Amomum Verum, or *True Amomum*, is a round fruit, about the ſize of a middling grape; containing, under a membranous cover, a number of ſmall rough angular ſeeds, of a blackiſh brown colour on the outſide, and whitiſh within: the ſeeds are lodged in three diſtinct cells; thoſe in each cell are joined cloſely together, ſo as that the fruit, upon being opened, appears to contain only three ſeeds. Ten or twelve of theſe fruits grow together in a cluſter; and adhere without any pedicle, to a woody ſtalk about an inch long; each ſingle fruit is ſurrounded by ſix leaves, in form of a cup; and the part of the ſtalk void of fruit is clothed with leafy ſcales.—The huſks, leaves, and ſtems, have a light grateful ſmell, and a moderately warm aromatic taſte: the ſeeds, freed from the huſks, are in both reſpects much ſtronger; their ſmell is quick and penetrating, their taſte pungent, approaching to that of camphor. Notwithſtanding amomum is an elegant aromatic, it has long been a ſtranger to the ſhops.

Amomum Vulgare. See Sison.

AMONTONS (William), an ingenious experimental philoſopher, was born at Paris in 1663. While he was at the grammar-ſchool. he by ſickneſs contracted a deafneſs that almoſt excluded him converſation. In this ſituation, he applied himſelf to mechanics and geometry; and, it is ſaid, refuſed to try any remedy for his diſorder, either becauſe he deemed it incurable, or becauſe it increaſed his attention. He ſtudied the nature of barometers and thermometers with great care; and wrote *Obſervations and Experiments concerning a new Hour-glaſs, and concerning Barometers, Thermometers, and Hygroſcopes;* which, with ſome pieces in the Journal des Sçavans, are all his literary works. When the royal academy was new regulated in 1699, he was admitted a member; and read his *New Theory of Friction*, in which he happily cleared up an import ant object in mechanics. He died in 1705.

AMORÆANS, a ſect or order of gemaric doctors, or commentators on the Jeruſalem Talmud. The Amoræans ſucceeded the Miſchnic doctors. They ſubſiſted 250 years; and were ſucceeded by the Seburæans.

AMORGOS, or Amurgus (anc. geog.), now *Morgo*, not far from Naxus to the eaſt, one of the European Sporades; the country of Simonides the Iambic poet. To this iſland criminals were baniſhed. It was famous for a fine flax called *Emorgis*.

AMORITES, a people deſcended from Amorrhæus, according to the Septuagint and Vulgate; Emoræus, according to other expoſitors; Hæmori, according to the Hebrew; or Emorite, according to our verſion of the bible; who was the fourth ſon of Canaan, Gen. x. 16.

The Amorites firſt of all peopled the mountains lying to the weſt of the Dead Sea. They had likewiſe eſtabliſhments to the eaſt of the ſame ſea, between the brooks of Jabbock and Arnon, from whence they forced the Ammonites and Moabites. Numb. xiii. 30. xxi. 29. Joſh. v. 1. and Judges xi. 19, 20. Moſes made a conqueſt of this country from their kings Shihon and Og, in the year of the world 2553.

The prophet Amos (ii. 9.), ſpeaking of the gigantic ſtature and valour of the Amorites, compares their height with that of cedars, and their ſtrength with that

that of an oak. The name Amorite is often taken in Scripture for all Canaanites in general. The lands which the Amorite poffeffed on this fide Jordan were given to the tribe of Judah, and thofe which they had enjoyed beyond this river were diftributed between the tribes of Reuben and Gad.

AMORIUM, a town of Phrygia Major, near the river Sangarius, on the borders of Galatia.—It was taken from the Romans by the Saracens in 668; but foon after retaken by the Romans.—A war breaking out again between thefe two nations in 837, the Roman emperor Theophylus deftroyed Sozopetra the birth-place of the khalif Al' Motafem, notwithftanding his earneft intreaties to him to fpare it. This fo enraged the khalif, that he ordered every one to engrave upon his fhield the word *Amorium*, the birth-place of Theophylus, which he refolved at all events to deftroy. Accordingly he laid fiege to the place, but met with a vigorous refiftance. At length, after a fiege of 55 days, it was betrayed by one of the inhabitants who had abjured the Chriftian religion. The khalif, exafperated at the lofs he had fuftained during the fiege, put moft of the men to the fword, carried the women and children into captivity, and levelled the city with the ground. His forces being diftreffed for want of water on their return home, the Chriftian prifoners rofe upon fome of them, and murdered them; upon which the khalif put 6000 of the prifoners to death.—According to the eaftern hiftorians, 30,000 of the inhabitants of Amorium were flain, and as many carried into captivity.

AMORPHA, False Indigo: A genus of the decandria order, belonging to the diadelphia clafs of plants; and in the natural method ranking under the 32d order, *Papilionaceæ*. The characters are: The *calyx* is a fingle-leaved perianthium, tubular and perfiftent: The *corolla* confifts of an ovate, concave, erect petal, fcarcely larger than, and placed on the upper fide of, the calyx: The *ftamina* confift of ten erect unequal filaments, longer than the corolla; the antheræ are fimple. The *piftillum* has a roundifh germen; the ftylus fubulated, and the length of the ftamina; the ftigma fimple: The *pericarpium* is a lunated unilocular legumen, reflected, larger than the calyx, and tuberculated: The *feeds* are two, and kidney-fhaped. By the corolla alone this genus may be diftinguifhed from all the known plants in the univerfe: The petals are the banner, the wings and keel are wanting; which is very fingular in a papilionaceous corolla.

Of this there is only one known fpecies, a native of Carolina, where the inhabitants formerly made from it a courfe kind of indigo, whence the plant took its name. It rifes, with many irregular ftems, to the height of 12 or 14 feet. The leaves are late in the fpring before their foliage is fully difplayed. The ends of their branches are generally deftroyed by the froft; or, if they recover it, they have the appearance of being dead; whilft other plants teftify their effects of the reviving months. But, notwithftanding thefe defects, this tree has fome other good properties that in part make amends for them. The leaves, when out, which will not be before the middle of May, are admired by all. They are of a pleafant green colour; are very large, beautifully pinnated, the folioles being arranged along the ftalk by pairs, and terminate by an odd one. The flowers are of a purple colour, and fhow themfelves in perfection with us the beginning of July. They grow in fpikes, feven or eight inches long, at the ends of the branches, and are of a fingular ftructure. In order to make this tree have its beft effect, it fhould be planted among others of its own growth, in a well-fheltered fituation; by which means the ends will not be fo liable to be deftroyed by the winter's frofts; the branches will not fuffer by the violence of the winds; and as it is fubject to put out many branches near the root, thefe indelicacies and imperfections will be concealed; whilft the tree will fhow itfelf to the utmoft advantage when in blow, by elevating its purple-fpiked flowers amongft the others in a pleafing view. The feeds of this plant were firft fent to England by Mr Mark Catefby in 1724, from which many plants were raifed in the gardens near London. Thefe were of quick growth, and feveral of them produced flowers in three years.

Culture. The amorpha is moft readily propagated by feeds, which ought to be procured annually from America. It may alfo be propagated by laying down the young branches, which in one year will make good roots; and may then be taken off, and planted either in the nurfery, or in the places where they are defigned to remain. If they are put into a nurfery, they fhould not remain there more than one year; for as the plants make large fhoots, they do not remove well when they have remained long in a place.

AMORTIZATION, in law, the alienation of lands or tenements to a corporation or fraternity and their fucceffors. See Mortmain.

AMOS, the fourth of the fmall prophets, who in his youth had been a herdfman in Tekoa, a fmall town about four leagues fouthward of Jerufalem, was fent to the kine of Bafhan, that is, to the people of Samaria, or the kingdom of Ifrael, to bring them back to repentance, and an amendment of their lives; whence it is thought probable that he was born within the territories of Ifrael, and only retired to Tekoa on his being driven from Bethel, by Amaziah the prieft of the golden calves at Bethel.

The prophet being thus retired to Tekoa, in the kingdom of Judah, continued to prophefy. He complains in many places of the violence offered him, by endeavouring to oblige him to filence. He boldly remonftrates againft the crying fins that prevailed among the Ifraelites, as idolatry, oppreffion, wantonnefs, and obftinacy. He likewife reproves thofe of Judah, fuch as their carnal fecurity, fenfuality, and injuftice. He terrifies them both with frequent threatenings, and pronounces that their fins will at laft end in the ruin of Judah and Ifrael, which he illuftrates by the vifions of a plumb-line and a bafket of fummer-fruit. It is obfervable in this prophecy, that as it begins with denunciation of judgment and deftruction againft the Syrians, Philiftines, Tyrians, and other enemies of the Jews, fo it concludes with comfortable promifes of reftoring the tabernacle of David, and erecting the kingdom of Chrift. Amos was chofen to the prophetic office in the time of Uzziah king of Judah, and Jeroboam the fon of Joafh, king of Ifrael, two years before the earthquake (Amos i. 1.), which happened in the 24th or 25th year of Uzziah, according to the rabbins and moft of the modern commentators; or the

year of the world 3219, when this prince usurped the priest's office, and attempted to offer incense to the Lord: but it is observed, that this cannot be the case, because Jotham the son of Uzziah, who was born in 3221, was of age to govern, and consequently was between 15 and 20 years of age, when his father undertook to offer incense, and was struck with a leprosy. The first of the prophecies of Amos, in order of time, are those of the 7th chapter: the rest he pronounced in the town of Tekoa, whither he retired. He foretold the misfortunes which the kingdom of Israel should fall into after the death of Jeroboam II. who was then living; he foretold the death of Zechariah, the invasion of the lands belonging to Israel by Phul and Tiglath-Pilesser kings of Assyria; and he speaks of the captivity of the ten tribes, and their return.

The time and manner of this prophet's death are not known. Some old authors relate that Amaziah, priest of Bethel, provoked by the discourses of the prophet, had his teeth broke, in order to silence him. Others say, that Hosea or Uzziah, the son of Amaziah, struck him with a stake upon the temples, knocked him down, and wounded him much; in which condition he was carried to Tekoa, where he died, and was buried with his fathers; but it is generally thought that he prophesied a long time at Tekoa, after the adventure which he had with Amaziah; and the prophet himself taking no notice of the ill treatment which he is said to have received, is an argument that he did not suffer in the manner they relate.

St Jerom observes, that there is nothing great or sublime in the style of Amos. He applies the words of St Paul (2 Cor. xi. 6.) to him, 'rude in speech though not in knowledge.' And he farther observes, that he borrows his comparison from the state and profession to which he belonged.

AMOY, an island in the province of Fokien, in China, where the English had a factory: but they have abandoned it on account of the impositions of the inhabitants. Long. 136. 0. Lat. 24. 30. It has a fine port, that will contain many thousand vessels. The emperor has a garrison here of 7000 men.

AMPELIS, the vine, in botany. See VITIS.

AMPELIS, the *Chatterer*, in zoology, a genus of birds belonging to the order of passeres; the distinguishing characters of which are, that the tongue is furnished with a rim or margin all round, and the bill is conical and strait. There are seven species, all natives of foreign countries, except the garrulus, which is a native both of Europe and the West Indies. In the former, the native country of these birds is Bohemia; from whence they wander over the rest of Europe, and were once superstitiously considered as presages of a pestilence. They appear annually about Edinburgh in February; and feed on the berries of the mountain-ash. They also appear as far south as Northumberland; and, like the field-fare, make the berries of the white-thorn their food. It is but by accident that they ever appear farther south. They are gregarious; feed on grapes, where vineyards are cultivated; are easily tamed; and are esteemed delicious food. This species is about the size of the black-bird: the bill is short, thick, and black; on the head is a sharp pointed crest reclining backwards: the lower part of the tail is black; the end of a rich yellow: the quill-feathers are black, the three first tipt with white; the six next have half an inch of their exterior margin edged with fine yellow, the interior with white. But what distinguishes this from all other birds, are the horny appendages from the tips of seven of the secondary feathers, of the colour and gloss of the best red wax.

AMPELITES, CANNEL-COAL, or CANDLE-COAL, a hard, opaque, fossile, inflammable substance, of a black colour. It does not effervesce with acids. The ampelites, though much inferior to jet in many respects, is yet a very beautiful fossile; and, for a body of so compact a structure, remarkably light. Examined by the microscope, it appears composed of innumerable very small and thin plates, laid closely and firmly on one another; and full of very small specks of a blacker and more shining matter than the rest, which is evidently a purer bitumen than the general mass. These specks are equally diffused over the different parts of the masses. There is a large quarry of it near Alençon in France. It is dug in many parts of England, but the finest is in Lancashire and Cheshire; it lies usually at considerable depths. It makes a very brisk fire, flaming violently for a short time, and after that continuing red and glowing hot a long while; and finally is reduced into a small proportion of grey ashes, the greater part of its substance having flown off in the burning.—It is capable of a very high and elegant polish; and, in the countries where it is produced, is turned into a vast number of toys, as snuff-boxes and the like, which bear all the nicety of turning, and are made to pass for jet.—Husbandmen smear their vines with it, as it kills the vermin which infests them. It is likewise used for the dyeing of hair black. In medicine, it is reputed good in colics, against worms, and of being in general an emollient and discutient; but the present practice takes no notice of it.

AMPELUSIA, (anc. geog.) a promontory of Mauritania Tingitana, called *Cottes* by the natives, which is of the same signification with a town of the same name not far from the river Lixus, near the straits of Gibraltar: now *Cape Spartel*. W. Long. 6. 30. Lat. 36. 0.

AMPHERES, in antiquity, a kind of vessels wherein the rowers plied two oars at the same time, one with the right hand and another with the left.

AMPHIATHROSIS, in anatomy, a term for such junctures of bones as have an evident motion, but different from the diarthrosis, &c. See DIARTHROSIS.

AMPHIARAUS, in pagan mythology, a celebrated prophet, who possessed part of the kingdom of Argos. He was believed to excel in divining by dreams, and is said to be the first who divined by fire. Amphiaraus knowing, by the spirit of prophecy, that he should lose his life in the war against Thebes, hid himself in order to avoid engaging in that expedition: but his wife Eriphyle, being prevailed upon by a present, discovered the place in which he had concealed himself; so that he was obliged to accompany the other princes who marched against Thebes. This proved fatal to him; for the earth being split asunder by a thunder-bolt, both he and his chariot were swallowed up in the opening.—Amphiaraus, after his death, was ranked among the gods; temples were dedicated to him; and his oracle, as well as the sports instituted to his honour, were very famous.

Amphibia.

AMPHIBIA, in zoology, the name of Linnæus's third clafs of animals; including all thofe which live partly in water and partly on land. This clafs he fubdivides into four orders, *viz.* The amphibia reptiles; the amphibia ferpentes; the amphibia nantes; and the amphibia meantes. See ZOOLOGY.

It has been a queftion whether the animals commonly called *amphibious*, live moft in the water or on land. If we confider the words αμφι (*utrinque*, both ways), and βιος (*vita*, life), from which the term *amphibious* is derived; we fhould underftand, that animals, having this title, fhould be capable of living as well by land, or in the air, as by water; or of dwelling in either conftantly at will: but it will be difficult to find any animal that can fulfil this definition, as being equally qualified for either. An ingenious naturalift*, therefore, from confidering their œconomy refpectively, divides them into two orders, *viz.* 1. Such as enjoy their chief functions by land, but occafionally go into the water. 2. Such as chiefly inhabit the water, but occafionally go afhore. What he advances on this fubject is curious, and well illuftrates the nature of this clafs.

* Dr *Parfons*; in a paper read before the Royal Society.

1. Of the firft order, he particularly confiders the phocæ; and endeavours to fhow, that none of them can live chiefly in the water, but that their chief enjoyment of the functions of life is on fhore.

Thefe animals (he obferves) are really quadrupeds†; but, as their chief food is fifh, they are under a neceffity of going out to fea to hunt their prey, and to great diftances from fhore; taking care that, however great the diftance, rocks or fmall iflands are at hand, as refting-places when they are tired, or when their bodies become too much macerated in the water; and they return to the places of their ufual refort to fleep, copulate, and bring forth their young, for the following reafons, viz. It is well known, that the only effential difference (as to the general ftructure of the heart) between amphibious and mere land animals, or fuch as never go into the water, is, that in the former the oval hole remains always open. Now, in fuch as are without this hole, if they were to be immerfed in water for but a little time, refpiration would ceafe, and the animal muft die; becaufe a great part of the mafs of blood paffes from the heart by the pulmonary artery through the lungs, and by the pulmonary veins returns to the heart, while the aorta is carrying the greater part of the mafs to the head and extremities, &c.

† See the article *Phoca*.

Now, the blood paffes through the lungs in a continual uninterrupted ftream, while refpiration is gentle and moderate: but when it is violent, then the circulation is interrupted, for infpiration and exfpiration are now carried to their extent; and in this ftate the blood cannot pafs through the lungs either during the total infpiration or total exfpiration of the air in breathing: for, in the former cafe, the inflation compreffes the returning veins; and, in the latter, by the collapfion of the lungs, thefe veins are interrupted alfo; fo that it is only between thefe two violent actions that the blood can pafs: and hence it is, that the lives of animals are fhortened, and their health impaired, when they are fubjected to frequent violent refpiration; and thus it is, that when animals have once breathed, they muft continue to refpire ever after, for life is at an end when that ceafes.

There are three neceffary and principal ufes of refpiration in all land-animals, and in thofe kinds that are counted amphibious.—The firft is that of promoting the circulation of the blood through the whole body and extremities. In real fifhes, the force of the heart is alone capable of fending the blood to every part, as they are not furnifhed with limbs or extremities; but in the others mentioned, being all furnifhed with extremities, refpiration is an affiftant force to the arteries in fending blood to the extremities; which, being fo remote from the heart, have need of fuch affiftance, otherwife the circulation would be very languid in thefe parts: thus we fee, that in perfons fubject to afthmatic complaints, the circulation grows languid, the legs grow cold and oedematous, and other parts fuffer by the defect in refpiration.—A fecond ufe of breathing is, that, in infpiration, the variety of particles, of different qualities, which float always in the air, might be drawn into the lungs, to be infinuated into the mafs of blood, being highly neceffary to contemperate and cool the agitated mafs, and to contribute refined pabulum to the finer parts of it, which, meeting with the daily fupply of chyle, ferves to affimilate and more intimately mix the mafs, and render its conftitution the fitter for fupporting the life of the animal. Therefore it is, that valetudinarians, by changing foul or unwholefome air for a free, good, open air, often recover from lingering difeafes.—A third principal ufe of refpiration is, to promote the exhibition of voice in animals; which all thofe that live on the land do according to their fpecific natures.

From thefe confiderations it appears, that the phocæ of every kind are under an abfolute neceffity of making the land their principal refidence. But there is another very convincing argument why they refide on fhore the greateft part of their time; namely, that the flefh of thefe creatures is analogous to that of other land animals; and therefore, by over long maceration, added to the fatigue of their chacing their prey, they would fuffer fuch a relaxation as would deftroy them. It is well known, that animals which have lain long under water, are reduced to a very lax and even putrid ftate; and the phoca muft bafk in the air on fhore: for while the folids are at reft, they acquire their former degree of tenfion, and the vigour of the animal is reftored; and while he has an uninterrupted placid refpiration, his blood is refrefhed by the new fupply of air, as explained above, and he is rendered fit for his next cruife: for action waftes the moft exalted fluids of the body, more or lefs, according to its duration and violence; and the reftorative reft muft continue a longer or fhorter time, according to the quantity of the previous fatigue.

Let us now examine by what power thefe animals are capable of remaining longer under water than land-animals.

All thefe have the oval hole open between the right and left auricles of the heart; and, in many, the canalis arteriofus alfo: and while the phoca remains under water, which he may continue an hour or two more or lefs, his refpiration is ftopped; and the blood, not finding the paffage through the pulmonary artery free, rufhes through the hole from the right to the left auricle, and partly through the arterial canal, being a fhort paffage to the aorta, and thence to every part of the body, maintaining the circulation: but, upon rifing to

 to come aſhore, the blood finds its paſſage again thro' the lungs the moment he reſpires.

Thus the fœtus in utero, during its confinement, having the lungs compreſſed, and conſequently the pulmonary arteries and veins impervious, has the circulation of the blood carried on through the oval hole and the arterial canal. Now, ſo far the phoca in the water, and the fœtus in utero, are analogous; but they differ in other material circumſtances. One is, that the fœtus having never reſpired, remains ſufficiently nouriſhed by the maternal blood circulating through him, and continues to grow till the time of his birth, without any want of reſpiration during nine months confinement: the phoca, having reſpired the moment of his birth, cannot live very long without it, for the reaſons given before; and this hole and canal would be cloſed in them, as it is in land-animals, if the dam did not, ſoon after the birth of the cub, carry him ſo very frequently into the water to teach him; by which practice theſe paſſages are kept open during life, otherwiſe they would not be capable of attaining the food deſigned for them by Providence.

Another difference is, that the phoca, as was ſaid before, would be relaxed by maceration in remaining too long in the water; whereas the fœtus in utero ſuffers no injury from continuing its full number of months in the fluid it ſwims in: the reaſon is, that water is a powerful ſolvent, and penetrates the pores of the ſkins of land-animals, and in time can diſſolve them; whereas the *liquor amnii* is an inſipid ſoft fluid, impregnated with particles more or leſs mucilaginous, and utterly incapable of making the leaſt alteration in the cutis of the fœtus.

Otters, beavers, and ſome kinds of rats, go occaſionally into the water for their prey, but cannot remain very long under water. "I have often gone to ſhoot otters (ſays our author), and watched all their motions: I have ſeen one of them go ſoftly from a bank into the river, and dive down; and in about two minutes riſe, at 10 or 15 yards from the place he went in, with a middling ſalmon in his mouth, which he brought on ſhore: I ſhot him, and ſaved the fiſh whole." Now, as all fœtuſes have theſe paſſages open, if a whelp of a true water-ſpaniel was, immediately after its birth, ſerved as the phoca does her cubs, and immerſed in water, to ſtop reſpiration for a little time every day, it is probable that the hole and canal would be kept open, and the dog be made capable of remaining as long under water as the phoca.

Frogs, how capable ſoever of remaining in the water, yet cannot avoid living on land, for they reſpire; and if a frog be thrown into a river, he makes to the ſhore as faſt as he can.

The lizard kind, ſuch as may be called water-lizards (ſee LACERTA), are all obliged to come to land, in order to depoſite their eggs, to reſt, and to ſleep. Even the crocodiles, who dwell much in rivers, ſleep and lay their eggs on ſhore; and, while in the water, are compelled to riſe to the ſurface to breathe; yet, from the texture of his ſcaly covering, he is capable of remaining in the water longer by far than any ſpecies of the phoca, whoſe ſkin is analogous to that of a horſe or cow.

The hippopotamus (ſee HIPPOPOTAMUS), who wades into the lakes or rivers, is a quadruped, and remains under the water a conſiderable time; yet his chief reſidence is upon land, and he muſt come on ſhore for reſpiration.

The teſtudo, or ſea tortoiſe (ſee TESTUDO), though he goes out to ſea and is often found far from land; yet being a reſpiring animal, cannot remain long under water. He has indeed a power of rendering himſelf ſpecifically heavier or lighter than the water, and therefore can let himſelf down to avoid an enemy or a ſtorm: yet he is under a neceſſity of riſing frequently to breathe, for reaſons given before; and his moſt uſual ſituation, while at ſea, is upon the ſurface of the water, feeding upon the various ſubſtances that float in great abundance every where about him; theſe animals ſleep ſecurely upon the ſurface, but not under water; and can remain longer at ſea than any other of this claſs, except the crocodile, becauſe, as it is with the latter, his covering is not in danger of being too much macerated; yet they muſt go on ſhore to copulate and lay their eggs.

2. The conſideration of theſe is ſufficient to inform us of the nature of the firſt order of the claſs of amphibious animals; let us now ſee what is to be ſaid of the ſecond in our diviſion of them, which are ſuch as chiefly inhabit the waters, but occaſionally go on ſhore.

Theſe are but of two kinds: the eels, and water ſerpents or ſnakes of every kind. It is their form that qualifies them for loco-motion on land, and they know their way back to the water at will; for by their ſtructure they have a ſtrong periſtaltic motion, by which they can go forward at a pretty good rate: whereas all other kinds of fiſh, whether vertical or horizontal, are incapable of a voluntary loco-motion on ſhore; and therefore, as ſoon as ſuch fiſh are brought out of the water, after having flounced a while, they lie motionleſs, and ſoon die.

Let us now examine into the reaſon why theſe vermicular fiſh, the eel and ſerpent kinds, can live a conſiderable time on land, and the vertical and horizontal kinds die almoſt immediately when taken out of the water: and, in this reſearch, we ſhall come to know what analogy there is between land animals and thoſe of the waters. All land-animals have lungs, and can live no longer than while theſe are inflated by the ambient air, and alternately compreſſed for its expulſion; that is, while reſpiration is duly carried on, by a regular inſpiration and exſpiration of air.

In like manner, the fiſh in general have, inſtead of lungs, gills or branchiæ: and as in land-animals the lungs have a large portion of the maſs of blood circulating through them, which muſt be ſtopped if the air has not a free ingreſs and egreſs into and from them; ſo, in fiſh, there is a great number of blood-veſſels that paſs through the branchiæ, and a great portion of their blood circulates through them, which muſt in like manner be totally ſtopped, if the branchiæ are not perpetually wet with water. So that, as the air is to the lungs in land-animals a conſtant aſſiſtant to the circulation; ſo is the water to the branchiæ of thoſe of the rivers and ſeas: for when theſe are out of the water, the branchiæ very ſoon grow criſp and dry, the blood-veſſels are ſhrunk, and the blood is obſtructed in its paſſage; ſo, when the former are immerſed in water, or otherwiſe prevented from having reſpiration, the circulation ceaſes, and the animal dies.

Again,

Again, as land-animals would be deſtroyed by too much maceration in water; ſo fiſhes would, on the other hand, be ruined by too much exſiccation; the latter being, from their general ſtructure and conſtitution, made fit to bear, and live in, the water; the former, by their conſtitution and form, to breathe and dwell in the air.

But it may be aſked, why eels and water-ſnakes are capable of living longer in the air than the other kinds of fiſh? This is anſwered, by conſidering the providential care of the great Creator for theſe and every one of his creatures: for ſince they were capable of locomotion by their form, which they need not be if they were never to go on ſhore, it ſeemed neceſſary that they ſhould be rendered capable of living a conſiderable time on ſhore, otherwiſe their loco-motion would be in vain. How is this provided for? Why, in a moſt convenient manner: for this order of fiſhes have their branchiæ well covered from the external drying air; they are alſo furniſhed with a ſlimy mucus, which hinders their becoming criſp and dry for many hours; and their very ſkins always emit a mucous liquor, which keeps them ſupple and moiſt for a long time: whereas the branchiæ of other kinds of fiſh are much expoſed to the air, and want the ſlimy matter to keep them moiſt. Now, if any of theſe, when brought out of the water, were laid in a veſſel without water, they might be preſerved alive a conſiderable time, by only keeping the gills and ſurface of the ſkin conſtantly wet, even without any water to ſwim in.——

It has been advanced, that *man* may, by art, be rendered amphibious, and able to live under water as well as frogs. As the fœtus lives *in utero* without air, and the circulation is there continued by means of the foramen ovale; by preſerving the paſſage open, and the other parts *in ſtatu quo*, after the birth, the ſame faculty would ſtill continue. Now, the foramen, it is alleged, would be preſerved in its open ſtate, were people accuſtomed, from their infancy, to hold their breath a conſiderable time once a-day, that the blood might be forced to reſume its priſtine paſſage, and prevent its drying up as it uſually does. This conjecture ſeems, in ſome meaſure, ſupported by the practice of divers, who are taught from their childhood to hold their breath, and keep long under water, by which means the ancient channel is kept open.—A Calabrian monk at Madrid laid claim to this amphibious capacity, making an offer to the king of Spain, to continue twice twenty-four hours under water, without ever coming up to take breath. Kircher gives an account of a Sicilian, named the *fiſh Colas*, who, by a long habitude from his youth, had ſo accuſtomed himſelf to live in water, that his nature ſeemed to be quite altered; ſo that he lived rather after the manner of a fiſh than a man.

AMPHIBOLOGY, in grammar and rhetoric, a term uſed to denote a phraſe ſuſceptible of two different interpretations. Amphibology ariſes from the order of the phraſe, rather than from the ambiguous meaning of a word.

Of this kind was that anſwer which Pyrrhus received from the oracle: *Aio te, Æacida, Romanos vincere poſſe;* where the amphibology conſiſts in this, that the words *te* and *Romanos*, may either of them precede, or either of them follow, the words *poſſe vincere*, indifferently. See ORACLE.

The Engliſh language uſually ſpeaks in a more natural manner, and is not capable of any amphibologies of this kind: nor is it ſo liable to amphibologies in the articles, as the French and moſt other modern tongues.

AMPHIBRACHYS, in ancient poetry, the name of a foot conſiſting of three ſyllables, whereof that in the middle is long, and the other two ſhort; ſuch is the word [ăbīrĕ].

AMPHICOME, in natural hiſtory, a kind of figured ſtone, of a round ſhape, but rugged, and beſet with eminences, celebrated on account of its uſe in divination. The word is originally Greek, αμφικομη, *q. d. utrinque comata*, or "hairy on all ſides." This ſtone is alſo called *Erotylos*, Ερωτυλος, *Amatoria*, probably on account of its ſuppoſed power of creating love. The amphicome is mentioned by Democritus and Pliny, though little known among the moderns. Mercatus takes it for the ſame with the *lapis lumbricatus*, of which he gives a figure.

AMPHICTYONS, in Grecian antiquity, an aſſembly compoſed of deputies from the different ſtates of Greece: and reſembling, in ſome meaſure, the diet of the German empire.—Some ſuppoſe the word Αμφικτιονες to be formed of αμφι, "about," and κτιειν or κτιζειν, in regard the inhabitants of the country round about met here in council: others, with more probability, from *Amphictyon*, ſon of Deucalion, whom they ſuppoſe to have been the founder of this aſſembly; though others will have Acriſius, king of the Argives, to have been the firſt who gave a form and laws to it.

Authors give different accounts of the number of the Amphictyons, as well as of the ſtates who were intitled to have their repreſentatives in this council. According to Strabo, Harpocration, and Suidas, they were twelve from their firſt inſtitution, ſent by the following cities and ſtates; the Ionians, Dorians, Perrhæbians, Bœotians, Magneſians, Achæans, Phthians, Melians, Dolopians, Ænianians, Delphians, and Phocians. Æſchines reckons no more than eleven; inſtead of the Achæans, Ænianians, Delphians, and Dolopians, he only gives the Theſſalians, Oetians, and Locrians. Laſtly, Pauſanius's liſt contains only ten, viz. the Ionians, Dolopians, Theſſalians, Ænianians, Magneſians, Melians, Phthians, Dorians, Phſcians, and Locrians.

In the time of Philip of Macedon, the Phocians were excluded the alliance, for having plundered the Delphian temple, and the Lacedæmonians were admitted in their place; but the Phocians, 60 years after, having behaved gallantly againſt Brennus and his Gauls, were reſtored to their ſeat in the Amphictyonic council. Under Auguſtus, the city Nicopolis was admitted into the body; and to make room for it, the Magneſians, Melians, Phthians, and Ænianians, who till then had diſtinct voices, were ordered to be numbered with the Theſſalians, and to have only one common repreſentative. Strabo ſpeaks as if this council were extinct in the times of Auguſtus and Tiberius: but Pauſanias, who lived many years after, under Antoninus Pius, aſſures us it remained entire in his time, and that the number of Amphictyons was then 30.

The members were of two kinds. Each city ſent two deputies, under different denominations; one called Ἱερομνημον, whoſe buſineſs ſeems to have been more im-

mediately to inspect what related to sacrifices and ceremonies of religion; the other Πυλαγορας, charged with hearing and deciding of causes and differences between private persons. Both had an equal right to deliberate and vote, in all that related to the common interests of Greece. The *hieromnemon* was elected by lot; the *pylagoras* by plurality of voices.

Though the Amphictyons were first instituted at Thermopylæ, M. de Valois maintains, that their first place of residence was at Delphi; where, for some ages, the tranquillity of the times found them no other employment than that of being, if we may so call it, church-wardens of the temple of Apollo. In after-times, the approach of armies frequently drove them to Thermopylæ, where they took their station, to be nearer at hand to oppose the enemies progress, and order timely succour to the cities in danger. Their ordinary residence, however, was at Delphi.

Here they decided all public differences and disputes between any of the cities of Greece; but before they entered on business, they jointly sacrificed an ox cut into small pieces, as a symbol of their union. Their determinations were received with the greatest veneration, and even held sacred and inviolable.

The Amphictyons, at their admission, took a solemn oath never to divest any city of their right of deputation; never to avert its running waters; and if any attempts of this kind were made by others, to make mortal war against them: more particularly, in case of any attempt to rob the temple of any of its ornaments, that they would employ hands, feet, tongue, their whole power, to revenge it.—This oath was backed with terrible imprecations against such as should violate it; *e.g.* May they meet all the vengeance of Apollo, Diana, Minerva, &c. their soil produce no fruit, their wives bring forth nothing but monsters, &c.

The stated terms of their meeting was in spring and autumn; the spring meeting was called Εαρινη Πυλαια, that in autumn Μετοπωρινη. On extraordinary occasions, however, they met at any time of the year, or even continued sitting all the year round.

Philip of Macedon usurped the right of presiding in the assembly of the Amphictyons, and of first consulting the oracle which was called Προμαντεια.

AMPHIDROMIA, a feast celebrated by the ancients on the fifth day after the birth of a child.

AMPHIDRYON, in ecclesiastical writers, denotes the veil or curtain which was drawn before the door of the bema in ancient churches.

AMPHILOCHIA (anc. geog.), the territory of the city of Argos in Acarnania; *Amphilochium*, (Thucidydes); called *Amphilochi* (from the people,) in the lower age, (Stephanus.) A town also of Spain, in Gallicia, built by Teucer, and denominated from Amphilochus one of his companions, (Strabo): now *Orense*. W. Long. 8. 20. Lat. 42. 36.

AMPHILOCHIUS, bishop of Iconium, in the fourth century, was the friend of St Gregory Nazianzen and St Basil. He assisted at the first general council of Constantinople in 381; presided at the council of Sidæ; and was a strenuous opposer of the Arians. He died in 394; and his works were published in Greek and Latin at Paris 1644, by Francis Combesis.

AMPHILOCHUS, son of Amphiarus and Eriphyle, was a celebrated diviner. He had an altar erected to him at Athens, and an oracle at Mallus in Cilicia, which city was founded by him and Mopsus. The answers of this oracle were given by dreams; the party inquiring used to pass a night in the temple, and that night's dream was the answer. Dion Cassius mentions a picture done by order of Sextus Condianus, representing the answer he received of the oracle, in the reign of the emperor Commodus.

AMPHIMACER, in ancient poetry, a foot consisting of three syllables, whereof the first and last are long, and that in the middle short; such is the word [Cāstĭtās.]

AMPHION, son of Jupiter and Antiope; who, according to the poets, made the rocks follow his music; and at his harp the stones of Thebes danced into walls and a regular city.

AMPHIPOLES, in antiquity, the principal magistrates of Syracuse. They were established by Timoleon in the 109th Olympiad, after the expulsion of the tyrant Dionysius. They governed Syracuse for the space of 300 years: and Diodorus Siculus assures us, that they subsisted in his time.

AMPHIPOLIS, a city of Macedonia, an Athenian colony, on the Strymon, but on which side is not so certain: Pliny places it in Macedonia, on this side; but Scylax, in Thrace, on the other. The name of the town, *Amphipolis*, however, seems to reconcile their difference; because, as Thucidydes observes, it was washed on two sides by the Strymon, which dividing itself into two channels, the city stood in the middle, and on the side towards the sea there was a wall built from channel to channel. Its ancient name was Εννεα οδοι, the *Nine Ways*, (Thucidydes, Herodotus.) The citizens were called *Amphipolitani*, (Livy.) It was afterwards called *Christopolis*; now *Chrisopoli*, or *Chisopoli*, (Holstenius.)

AMPHIPOLIS, a town of Syria, on the Euphrates, built by Seleucus, called by the Syrians *Turmeda*, (Stephanus): the same with *Thapsacus*, (Pliny); and supposed to have been only renewed and adorned by Seleucus, because long famous before his time, (Xenophon.)

AMPHIPPII, in Grecian antiquity, soldiers who, in war, used two horses without saddles, and were dexterous enough to leap from one to the other.

AMPHIPRORÆ, in the naval affairs of the ancients, vessels with a prow at each end. They were used chiefly in rapid rivers and narrow channels, where it was not easy to tack about.

AMPHIPROSTYLE, in the architecture of the ancients, a temple which had four columns in the front, and as many in the aspect behind.

AMPHISBÆNA, in zoology, a genus of serpents belonging to the order of amphibia serpentes, so called from the false notion of its having two heads, because it moves with either end foremost.

The head of the amphisbæna is small, smooth, and blunt; the nostrils are very small; the eyes are minute and blackish; and the mouth is furnished with a great number of small teeth. The body is cylindrical, about a foot long, and divided into about 200 annular convex segments like those of a worm; and it has about 40 longitudinal streaks, of which 12 on each side are in the form of small crosses like the Roman X; the anus is a transverse slit; and the last ring or segment of the

belly has eight ſmall papillæ, forming a tranſverſe line before the anus; the tail, *i. e.* all the ſpace below the anus, is ſhort, conſiſting of 30 annular ſegments, without being marked with the croſs-lines, and is thick and blunt at the point. The colour of the whole animal is black, variegated with white; but the black prevails moſt on the back, and the white on the belly. It has a great reſemblanee to a worm, living in the earth, and moving equally well with either end foremoſt. There are but two ſpecies, viz. 1. The fuliginoſa, which anſwers exactly to the above deſeription, and is found in Libya and in different parts of America. 2. The alba, which is totally white, is a native of both the Indies, and is generally found in ant-hillocks. The bite of the amphiſbæna is reckoned to be mortal by many authors; but as it is not furniſhed with dog-fangs, the uſual inſtruments of conveying the poiſon of ſerpents, later writers eſteem it not to be poiſonous. They feed upon ants and earth-worms, but particularly the latter. See Plate XVI.

Amphisbæna *Aquatica*, a name given by Bertrutius, Albertus, and ſeveral other authors, to that long and ſlender inſect, called by others the *ſeta aquatica*, and *vermis ſetarius*. It has the name *amphiſbæna*, from its going backwards or forwards with equal eaſe and celerity. The uſual ſize is four or five inches long, and the thickneſs of a large hair.

Dr Liſter accidentally found out the origin of this worm, in his reſearches into the hiſtory of a very different ſort of inſect. Diſſecting one of the common black beetles dug up in a garden, he found in its belly two of theſe hair worms, or amphiſbænæ; and renewing the experiment on other beetles of the ſame ſpecies, he found that they uſually contained, one, two, or three of theſe worms. As ſoon as the body of the beetle is opened, they always crawl out. When put into water they will live a conſiderable time, and ſwim nimbly about; but often put up their heads above water, as if endeavouring to make their eſcape, and ſometimes faſtening themſelves by the mouth to the ſides of the veſſel, and drawing their whole bodies after them. Theſe creatures are not only found in the waters, but buried in earth, and ſometimes on the leaves of trees, in our gardens and hedges. Phil. Tranſ. No 83.

AMPHISCII, among geographers, a name applied to the people who inhabit the torrid zone. The Amphiſcii, as the word imports, have their ſhadows one part of the year towards the north, and the other towards the ſouth, according to the ſun's place in the ecliptic. They are alſo called *Aſcii*. See Ascii.

AMPHISSA (anc. geog.), the capital of the Locri Oxolæ, 120 ſtadia (or 15 miles) to the weſt of Delphi, (Pauſanias.) So called, becauſe ſurrounded on all hands by mountains, (Stephanus.) Hence *Amphiſſæi*, the inhabitants; who plundered the temple at Delphi, (Demoſthenes.)—Alſo a town of Magna Græcia, at the mouth of the Sagra, on the coaſt of the Farther Calabria, ſituated between Locri and Caulona; now called *Rocella*. *Amphiſſius* the epithet, (Ovid.)

AMPHITANE, among ancient naturaliſts, a ſtone ſaid to attract gold as the loadſtone does iron. Pliny ſays it was found in that part of the Indies where the native gold lay ſo near the ſurface of the earth as to be turned up in ſmall maſſes among the earth of ant-hills; and deſcribes it to have been of a ſquare figure, and of the colour and brightneſs of gold. The deſcription plainly points out a well-known foſſil, called, by Dr Hill, *pyricubium*: this is common in the mines of moſt parts of the world; but neither this nor any other ſtone was ever ſuppoſed, in our times, to have the power of attracting gold.

AMPHITHEATRE, in antiquity, a ſpacious edifice, built either round or oval, with a number of riſing ſeats, upon which the people uſed to behold the combats of gladiators, of wild beaſts, and other ſports.

Amphitheatres were at firſt only of wood; and it was not till the reign of Auguſtus, that Statilius Taurus built one, for the firſt time, of ſtone. The loweſt part was of an oval figure, and called *arena*, becauſe, for the conveniency of the combatants, it was uſually ſtrewed with ſand; and round the arena were vaults ſtyled *caveæ*, in which were confined the wild beaſts appointed for the ſhews.

Above the caveæ was erected a large circular periſtyle, or podium, adorned with columns. This was the place of the emperors, ſenators, and other perſons of diſtinction.

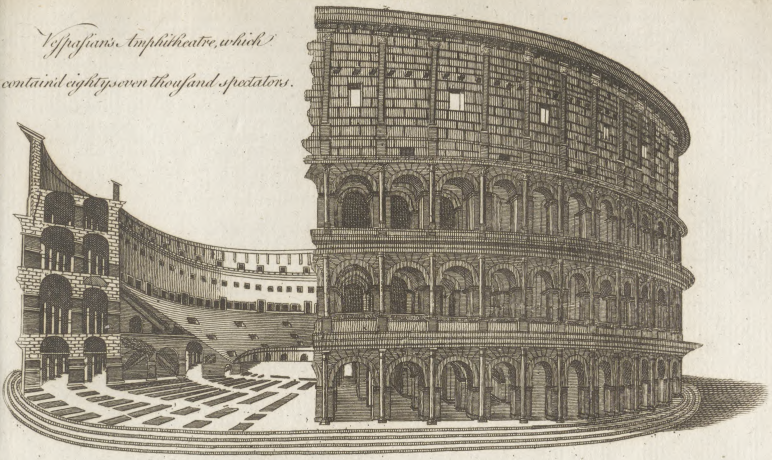
The rows of benches were above the podium. Their figure was circular; and they were entered by avenues, at the end of which were gates called *vomitoriæ*.

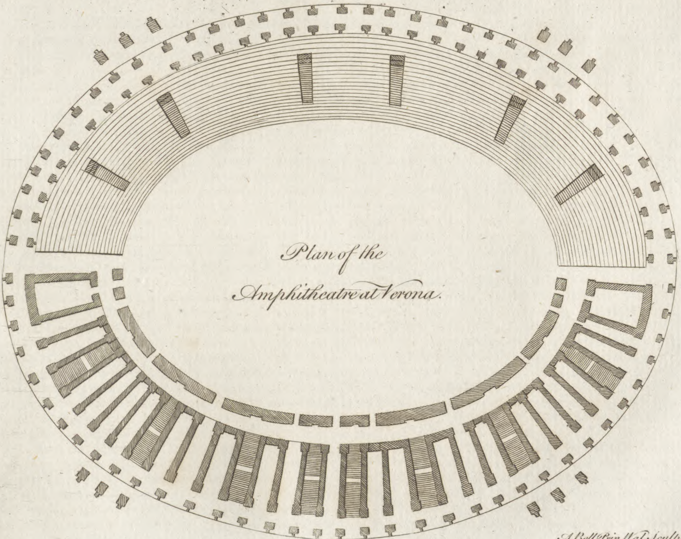
Their theatre was built in form of a ſemicircle, only exceeding a juſt ſemicircle by one fourth part of the diameter; and the amphitheatre was nothing elſe but a double theatre, or two theatres joined together: ſo that the longeſt diameter of the amphitheatre was to the ſhorteſt as $1\frac{1}{2}$ to 1.

There are amphitheatres ſtill ſtanding at Rome, at Pola, at Niſmes, &c. The amphitheatre of Veſpaſian, called the *Coliſeum*, and that at Verona in Italy, are the moſt celebrated now remaining of all antiquity. Remains of amphitheatres are ſhown alſo at Arles, Bourdeaux, &c. The amphitheatre at Pola, an ancient republic of Iſtria, is very entire: it conſiſts of two orders of Tuſcan pillars, one over the other. The lower have pedeſtals, which is extraordinary; this order having ſcarce ever more than baſes to ſupport them. The amphitheatre of Veſpaſian is computed to have been capable of holding 87,000 ſpectators. That of Verona is the beſt preſerved: for though moſt of the great and beſt ſtones of the outſide are picked out, yet the great vault, on which the rows of the ſeats are laid, is entire; the rows alſo (which are 44 in number) are entire. Every row is a foot and a half high, and as much in breadth; ſo that a man ſits conveniently in them; and allowing for a ſeat a foot and a half, the whole will hold 23,000 perſons. Pliny mentions an amphitheatre built by Curio, which turned on large iron pivots; ſo that of the ſame amphitheatre two ſeveral theatres were occaſionally made, whereon different entertainments were ſometimes preſented at the ſame time. Mr Brydone (vol. i. 295.) mentions an amphitheatre at Syracuſe, the theatre of which is ſo entire, that the *gradini* for ſeats ſtill remain; but it is a ſmall theatre, he ſays, in compariſon of the others. See Plate XIV.

Amphitheatre, in gardening, certain diſpoſitions of trees and ſhrubs on the ſides of hilly places, which, if the hill or riſing be naturally of a circular figure, always have the beſt effect. They are to be formed of evergreens, ſuch as hollies, phillereys, lauruſtines, bays, and

Vespasian's Amphitheatre, which contain'd eighty seven thousand spectators.





Plan of the Amphitheatre at Verona.

A. Bell Prin. Wal. Sculptor fecit.

and fuch plants, obferving to plant the fhorteft growing trees in the front, and thofe which will be the talleft behind, fuch as pines, firs, cedars of Lebanon, &c.

Amphitheatres are alfo fometimes formed of flopes on the fides of hills, covered only with turf; and, when well kept, they are a great ornament to large gardens.

AMPHITRITE, (αμφιτριτη, from *circumferendo*), in the heathen mythology, the wife of Neptune, and goddefs of the fea, fometimes taken for the fea.

AMPHITRYON, fon of Alcæus, lefs known by his own exploits than from his wife Alcmena's adventure. See ALCMENA.

AMPHORA, in antiquity, a liquid meafure among the Greeks and Romans. The Roman amphora contained 48 fextaries, equal to about feven gallons one pint Englifh wine-meafure; and the Grecian or Attic amphora contained one-third more.

AMPHORA was alfo a dry meafure ufed by the Romans, and contained about three bufhels.

AMPHORA, among the Venetians, is the largeft meafure ufed for liquids, containing about 16 quarts.

AMPHORARIUM VINUM, in antiquity, denotes that which is drawn or poured into *amphoræ* or pitchers; by way of diftinction from *vinum doliare*, or cafk wine.—The Romans had a method of keeping wine in *amphoræ* for many years to ripen, by faftening the lids tight down with pitch or gypfum, and placing them either in a fituation where the fmoke came, or under ground.

AMPHOTIDES, in antiquity, a kind of armour or covering for the ears, worn by the ancient pugiles, to prevent their adverfaries from laying hold of that part.

AMPHRYSUS, or AMPHRYSSUS, (anc. geog.) a river of Phthiotis a diftrict of Theffaly, running by the foot of mount Othrys, from fouth to north, into the Enipeus at Thebes of Theffaly; where Apollo fed the herds of king Admetus (Virgil, Lucan). Another Amphryfus in Phrygia, rendering women barren, according to Pliny: Hence the epithet *Amphryfiacus* (Statius). Alfo a town of Phocis, at the foot of mount Parnaffus, encompaffed with a double wall by the Thebans in the war with Philip (Paufanias): *Amphryfia Vates*, in Virgil, denotes the Sibyl.

AMPHTHILL, a town in Bedfordfhire, feated pleafantly between two hills, but in a barren foil. W. Long. 0. 29. N. Lat. 52. 2.

AMPLIATION, in a general fenfe, denotes the act of enlarging or extending the compafs of a thing.

On a medal of the emperor Antoninus Pius, we find the title *Ampliator civium* given him, on account of his having extended the *jus civitatis*, or right of citizenfhip, to many ftates and people before excluded from that privilege. In effect, it is generally fuppofed to have been this prince that made the famous conftitution, whereby all the fubjects of the empire were made citizens of Rome.

AMPLIATION, in Roman antiquity, was the deferring to pafs fentence in certain caufes. This the judge did, by pronouncing the word *amplius*; or by writing the letters N. L. for *non liquet*: thereby fignifying, that, as the caufe was not clear, it would be neceffary to bring further evidence.

AMPLIFICATION, in rhetoric, part of a difcourfe or fpeech, wherein a crime is aggravated, a praife or commendation heightened, or a narration enlarged, by an enumeration of circumftances; fo as to excite the proper emotions in the fouls of the auditors. Such is the paffage in Virgil, where, inftead of faying merely that Turnus died, he amplifies the circumftances of his death.

—Aft illi folvuntur frigore membra,
Vitaque cum gemitu fugit indignata fub umbras.

The mafters of eloquence make amplification to be the foul of difcourfe. See ORATORY, n° 39.

AMPLITUDE, in aftronomy, an arch of the horizon intercepted between the eaft or weft point and the centre of the fun, or a planet, at its rifing or fetting; and fo is either north and fouth, or ortive and occafive.

Magnetical AMPLITUDE, the different rifing or fetting of the fun from the eaft or weft points of the compafs. It is found by obferving the fun, at his rifing and fetting, by an amplitude-compafs.

AMPSAGA, a river of ancient Numidia. See ALGIERS, n° 57.

AMPSANCTI VALLIS, or AMPSANCTI LACUS, a cave or lake in the heart of the Hirpini, or Principato Ultra, near the city Tricento (Cicero, Virgil, Pliny); it is now called *Moffetta*, from Mephitis, the goddefs of ftench, who had a temple there. The ancient poets imagined that this gulf led to hell. The Moffetta is thus defcribed by Mr Swinburn: "We were led into a narrow valley, extending a confiderable way to the fouth-weft, and preffed in on both fides by high ridges thickly covered with copfes of oak. The bottom of the dell is bare and arid: in the loweft part, and clofe under one of the hills, is an oval pond of muddy afh-coloured water, not above 50 feet in diameter: it boils up in feveral places with great force in irregular fits, which are always preceded by a hiffing found. The water was feveral times fpouted up as high as our heads in a diagonal direction, a whirlpool being formed round the tube, like a bafon, to receive it as it fell. A large body of vapour is continually thrown out with a loud rumbling noife. The ftones on the rifing ground that hangs over the pool are quite yellow, being ftained with the fumes of fulphur and fal ammoniac. A moft naufeous fmell rifing with the fteam obliged us to watch the wind, and keep clear of it, to avoid fuffocation. The water is quite infipid both as to tafte and fmell; the clay at the edges is white, and carried into Puglia to rub upon fcabby fheep, on which account the lake is farmed out at 100 ducats a-year. On a hill above this lake ftood formerly a temple dedicated to the goddefs Mephitis; but I perceived no remains of it."

AMPULLA, in antiquity, a round big-bellied veffel which the ancients ufed in their baths, to contain oil for anointing their bodies.—Alfo the name of a cup for drinking out of at table.

AMPULLA, among ecclefiaftical writers, denotes one of the facred veffels ufed at the altars. Ampullæ were alfo ufed for holding the oil ufed in chrifmation, confecration, coronation, &c. Among the ornaments of churches we find frequent mention made of ampuls or vials. In the inventory of the cathedral of Lincoln we

we meet with ampuls of cryſtal, variouſly enriched with ſilver feet and covers; one containing a tooth of St Chriſtopher, another a tooth of St Cecily, another a bone of the head of St John Baptiſt.

Knights of St AMPULLA, belong to an order inſtituted by Clovis I. king of France; at the coronation they bear up the canopy, under which the ampulla is carried in proceſſion.

AMPURA, a province of the kingdom of Peru, before its conqueſt by the Spaniards. Here the inhabitants worſhipped two lofty mountains from a principle of gratitude, becauſe of the deſcent of the water from them by which their lands were fertilized. It is ſaid to have been conquered by Virachoca the eighth inca.

AMPURIAS, the capital of the territory of Ampurdan, in Catalonia, ſeated at the mouth of the river Fluvia, in E. Long. 2. 56. N. Lat. 42. 5. The land about it is barren, full of briars and bulruſhes, except in ſome places, which produce flax.

AMPUTATION, in ſurgery, the cutting off a limb, or any part, from the body. See SURGERY-*Index*.

AMRAPHEL, the king of Shinar, or Babylonia, confederated with Chedorlaomer, king of the Elamites, and two other kings, to make war againſt the kings of Pentapolis; that is to ſay, of Sodom, Gomorrah, and the three neighbouring cities. The kings who were in league with Amraphel worſted thoſe of Pentapolis, plundered their city, and carried off abundance of captives, among whom was Lot, Abraham's nephew: but Abraham purſued them, retook Lot, and recovered all the ſpoil. See ABRAHAM.

AMRAS, a ſtrong caſtle of Germany, ſeated in Tirol; by ſome German writers called *Arx Ambroſiana*, which was a houſe of pleaſure for the archdukes to retire to in the heat of the ſummer. By others this fort is called *Ombraſs;* a name derived from the deſign of it, which was to be a ſhady ſummer-houſe. It is moſt delightfully ſituated at the foot of a mountain, but has no great external beauty. All the furniture of ordinary uſe has been carried away; yet it is ſtill remarkable for its galleries, which contain a very large collection of antiquities, and both natural and artificial curioſities. It excels all others in its curious collection of armour and coats of mail, many of which belonged to very great men. There is alſo a great collection of gold medals, which weigh, as they affirm, about 16 pound; there are alſo 3000 cameos and intaglios, but few of them very fine. A great part of theſe antiquities were ſent to this place by Charles V. On the walls and cieling there are ſome very good paintings; and, among the reſt, they have an admirable picture of Noah's ark, done by Baſſano, for which the grand duke of Tuſcany is ſaid to have offered 100,000 crowns. They have a library, which is not in very good order; and a gallery full of buſts and other pieces of antiquity, beſides many other apartments adorned with pictures of great value. E. Long. 11. 40. N. Lat. 47. 0.

AMSANCTI. See AMPSANCTI.

AMSBURY, or AMBERSBURY, a town in Wiltſhire, lying in W. Long. 1. 20. N. Lat. 51. 29. It is the *Pagus Ambri*, famous for a monaſtery built by one Ambrus, and afterwards for a nunnery of noble women. There is a nobleman's ſeat here, built by Inigo Jones, to which new works were added under the direction of Lord Burlington. It is 80 miles weſt of London, and ſix miles north of Saliſbury.

AMSDORFIANS, in church-hiſtory, a ſect of Proteſtants in the 16th century, who took their name from Amſdorf their leader. They maintained, that good works were not only unprofitable, but were obſtacles to ſalvation.

AMSTERDAM, the capital city of the province of Holland and of the United Netherlands, is ſeated on the river Amſtel and an arm of the ſea called the *Wye*. The air is but indifferent, on account of the marſhes that ſurround it, and render the city almoſt inacceſſible: but this inconvenience is abundantly recompenſed by the utility of its commerce, which the port ſerves greatly to promote; for it will contain above a thouſand large ſhips.

In 1204, it was nothing but a ſmall caſtle, called *Amſtel* from the name of the river, which its lords made a retreat for fiſhermen, who at firſt lived in huts covered with thatch: but it ſoon became conſiderable, and had a bridge and towers built about it, inſomuch that it roſe to a ſmall city; though, till the year 1490, it was ſurrounded with nothing but a weak palliſado. The walls were then built with brick, to defend it from the incurſions of the inhabitants of Utrecht, with whom the Hollanders were often quarrelling; but ſome months afterwards it was almoſt reduced to aſhes. In 1512, it was beſieged by the people of Guelderland; who, not being able to take it, ſet fire to the ſhips in the harbour. In 1525, an Anabaptiſt leader, with 600 of his followers, got into the city in the night-time, attacked the town-houſe, and defeated thoſe that made any reſiſtance. At length they barricaded, with wool and hop-ſacks, the avenues to the market-place, where theſe enthuſiaſts were poſted; and ſo put a ſtop to their fury till day appeared, at which time the citizens fell upon them on all ſides, and forced them to retire into the town-houſe, where moſt of them were cut to pieces. About ten years after, there was another tumult raiſed by a parcel of fanatics, conſiſting of men and women, who ran about the ſtreets ſtark naked, and had a deſign of making themſelves maſters of the town-houſe. Their ſhrieks and cries, which were dreadful enough, ſoon alarmed the inhabitants, who ſeized the greateſt part of them, and gave them the chaſtiſement they deſerved.

Amſterdam was one of the laſt cities that embraced the reformed religion. It was beſieged by the Hollanders in 1578, and ſubmitted after a ſiege of ten months. One article of the capitulation was, a free exerciſe of the Roman-catholic religion: but this was not obſerved by the Proteſtants; for they ſoon drove the eccleſiaſtics, monks, and nuns, out of the city, broke the images, and demoliſhed the altars. From this time it became the general rendezvous of all nations and of every ſect, which raiſed it to that degree of grandeur and opulence it now enjoys. The inhabitants were often obliged to enlarge the bounds of their city, and in 1675 it was increaſed to its preſent extent. It was ſurrounded with a brick wall, and a large ditch 80 feet broad full of running water. The walls were fortified

Amsterdam with 26 bastions, on each of which there is now a windmill. There are eight gates towards the land, and one towards the water.

Amsterdam being seated on a marshy soil, is built on piles of wood; for which reason no coaches are allowed, except to great men and physicians, who pay a tax for that privilege; and all kinds of goods are drawn on sledges. It stands so low, that they would be exposed to inundations, if they did not secure themselves by dikes and sluices. The finest streets are, the Keysar's Graft, or Emperor's Canal; the Heer Graft, or Lords Canal; the Cingel; and the street of Haerlem. The principal canal is remarkable for its houses, which are magnificent structures of an equal height. Here are three prodigious sluices, and a great number of canals, which cross the city in many parts, and render the streets clean and pleasant. The canals are deep, their sides are lined with hewn stone, they have generally rows of trees planted on each side, and many stone-bridges over different parts of them.

The finest is that called the *Ammarack*, which is formed by the waters of the Amstel, into which the tide comes up, and on the sides of which are two large quays. This canal has several bridges. The principal is that next the sea, called *Pont-Neuf*, or the *New Bridge:* it is 600 feet long, and 70 broad, with iron balustrades on each side; it has 36 arches, of which 11 are very high, and eight are shut up to inclose the yachts. From this bridge there is a most charming prospect of the city, port, and sea. The port is a mile and half in length, and above 1000 paces in breadth. It is always filled with a multitude of vessels, which look like a forest, or rather a floating city. The streets in general are well paved, and the houses built of brick or stone. Towards the sides of the haven, the city is inclosed with great poles driven into the ground, which are joined by large beams placed horizontally. There are openings to let the ships in and out, which are shut every night at the ringing of a bell.

Amsterdam is computed to be half as big as London, including the fortifications, and almost as populous in proportion. There are people here of almost every nation and religion in Europe, who are all tolerated in their respective persuasions; but none admitted to any share in the government except the Calvinists. There are eleven churches for the Dutch of the established or Calvinistical religion, with two French and one High Dutch. The English have also three churches in this city; one for the Presbyterians, whose ministers are paid by the magistrates; a second for those of the church of England, whose minister is paid by his Britannic majesty; and a third for the Brownists, who maintain their own ministers. None but the Calvinists are allowed to have bells, and their ministers are maintained by the magistrates. All these churches or congregations make up only a third part of the inhabitants of the city. The Roman Catholic, who have 27 houses or chapels for their worship, form another third part. Here they have a long square of houses for their beguines (a kind of nuns) to live in; who are not shut up in cloysters as other nuns in Roman Catholic countries, but have liberty to walk abroad, and may even marry when they are tired of this kind of life. These chapels of the Roman catholics have no bells allowed them, being looked upon as conventicles, and Amsterdam may be shut up and opened according as the government pleases. The other third part of the city is made up of Jews, Lutherans, Arminians, Anabaptists, &c. none of whom, as was said of the Roman Catholics, are allowed to have bells in their churches. Those who marry, and are not of the established religion, are obliged to be joined first by the magistrates, and then they may perform the ceremony in their own assemblies. The Jews, who are very considerable in this place, have two synagogues; one of which, namely the Portuguese, is the largest in Europe. Within the court-yard, where their synagogue stands, they have several rooms or schools, where their children are taught Hebrew, and very carefully instructed in the Jewish religion.

The most remarkable of the religious buildings is the New Church, dedicated to St Catharine. It was begun in the year 1408, others say 1414; and was 100 years a-building. It had the misfortune of being burnt in the year 1645, but was in a short time after built in a more magnificent manner. The foundation of a steeple is laid before this church, which was designed to be very high. The piles on which it was to be erected are not above 100 feet square, and yet they are 6334 in number, and those very large. Neverthelefs it was thought that these vast piles, or rather the ground, were not able to support the prodigious weight they intended to lay upon it; for which reason the steeple remains unfinished. The pulpit is a masterpiece of the kind, where the four evangelists and many other curious pieces of sculpture are represented. The glass-windows are adorned with paintings, among which the emperor Maximilian is described, presenting an imperial crown to the burgomasters of Amsterdam for the crest of the arms of this city. The organ is very large, and reckoned one of the best in the world. It has a set of pipes that counterfeit a chorus of voices, and has 52 whole stops besides half stops, with two rows of keys for the feet, and three rows of keys for the hands. Those who hear it play for the first time imagine they hear a human voice. The grate dividing the chancel from the body of the church is all of Corinthian brass. The branches of candlesticks are the richest in the Seven Provinces. There is a very fine marble monument erected to Admiral Ruyter, who was killed at Messina.

The public buildings of a civil nature are very magnificent. The stadt-house was founded in 1648. It is built upon 14,000 wooden piles; and its front is 282 feet long, its sides 255 feet, and its height to the roof 116. There is a marble pediment in the front, whereon a woman is carved in relievo, holding the arms of the city; she is seated in a chair, supported by two lions, with an olive-branch in her right hand; on each side are four Naiads, who present her with a crown of palm and laurel, and two other marine goddesses present her with different sorts of fruit; besides, there is Neptune with his trident, accompanied with Tritons, a sea-unicorn, and a sea-horse. On the top stand three statues in bronze, representing Justice, Strength, and Plenty. On the top of the structure is a round tower, 50 feet above the roof, adorned with statues, and an harmonious chime of bells, the biggest of which weighs about 7000 pounds, and the next 6000. They are made to

Amfterdam play different tunes every month. It has not one handfome gate, but only feven doors to anfwer to the number of the United Provinces. On the floor of the great hall are two globes, the celeftial and terreftrial, which are 22 feet in diameter and 69 in circumference. They are made of black and white marble, and are inlaid with jafper and copper. In general, all the chambers are enriched with paintings, carvings, and gildings. While this ftadt-houfe was building, the old one was fet on fire, and confumed with all the archives and regifters.

Under the ftadt-houfe is a prodigious vault, wherein is kept the bank of Amfterdam, where there is a vaft quantity of ingots both of gold and filver, as alfo bags, which are fuppofed to be full of money. The doors are proof againft petards, and are never opened but in the prefence of one of the burgomafters. The prifons for debtors and criminals are likewife under the ftadt-houfe; as alfo the guard-room for the citizens, wherein the keys of the city are locked every night. At the end of the great hall is the fchepens or aldermens chamber, where civil caufes are tried. Befides thefe, there are the chambers of the fenate and council, the burgomafters chamber, the chambers of accounts, &c. In the fecond ftory is a large magazine of arms; and on the top of the building are fix large cifterns of water, which may be conveyed to any room in the houfe in cafe of fire; to prevent which the chimneys are lined with copper.

The bourfe, or exchange, where the merchants affemble, is all of free-ftone, and built upon 2000 wooden piles. Its length is about 250 feet, and its breadth 140. The galleries are fupported by 26 marble columns, upon each of which are the names of the people that are to meet there. They are all numbered; and there is a place fixed for every merchandife under fome one of thefe numbers. On the right hand of the gate is a fuperb ftair-cafe which leads to the galleries; on one fide of which there are feveral fhops, and on the other a place to fell clothes. It is not unlike the royal exchange in London.

The admiralty-office is in a houfe which belonged formerly to the princes of Orange. The arfenal for their men of war is in the harbour. This is a very handfome building, 200 feet long and 22 broad. The ground floor is filled with bullets; the fecond floor contains the arms and cordage; the third their fails, pulleys, flags, &c. This arfenal contains a great many curiofities; among the reft an Indian canoe brought from the ftraits of Davies, and a confervatory of water on the top of the houfe that holds 1600 tuns of water, which may be diftributed in cafe of fire into 16 different parts by leaden pipes. Hard by this edifice you fee the dock or yard where they build their men of war. This dock is 508 feet long, and contiguous to it are houfes for lodging the fhip-carpenters. The dock is plentifully fupplied with every thing neceffary for the conftruction of fhips.

The Eaft India company occupy a large building divided into feveral offices or apartments. In fome of thofe they have great ftores of packed goods, and likewife a room with all fort of drugs, tea, wax, ambergrife, and mufk. Here they have a magazine full of medicaments for furgeons chefts, to furnifh the company's fhips and garrifons in the Indies; as alfo large magazines of nutmegs, cloves, mace, and cinnamon. In the court-yard there is a guard-chamber, where every night the houfe-keeper has a watch; and on the other fide of the gate there is a chemift, who with his men prepares medicines for the Indies; and adjoining to this court-yard is their warehoufe and packhoufe for pepper and grofs goods. In the new part of the city they have a magazine or palace, which may properly be called an *arfenal.* The ground on which this building ftands is 2000 feet, and fquare every way, reckoning the moats or burgwall about it. The two rope-alleys are 1800 feet long, on the backfide of which is a ftore of 500 large anchors befides fmall ones. In this arfenal they build the fhips belonging to the India chamber of Amfterdam; for which reafon they have all forts of workhoufes here for the artificers that ferve the company.

The academy called the *Illuftrious School,* is likewife a very fine building. It was formerly a convent belonging to the nuns of St Agnes. Here they teach Latin, the oriental languages, theology, philofophy, hiftory, &c. The lawyers and phyficians have likewife their fchools.

Befides thefe, there are feveral hofpitals, or houfes for orphans, for poor widows, for fick perfons, and for mad people; all which are regulated with much prudence. The Rafp-houfe, which was formerly a nunnery, is now a fort of a work-houfe for men that behave ill. They are commonly fet to faw or rafp Brafil wood; and if they will not perform their tafk, they are put into a cellar which the water runs into, where if they do not almoft conftantly ply the pump, they run the rifk of being drowned. There is likewife a fpin-houfe for debauched women, where they are obliged to fpin wool, flax, and hemp, and do other work. All the hofpitals are extremely neat, and richly adorned with pictures. They are maintained partly by voluntary contributions, which are raifed by putting money into the poor's boxes fixed up all over the city; and partly by taxing all public diverfions, as well at fairs as elfewhere. Likewife every perfon that paffes through any of the gates at candle-light pays a penny for the fame ufes. Thefe charities are taken care of by certain officers called *deacons.* The governors are nominated by the magiftrates out of the moft confiderable men in the city.

The common fort have places of diverfion called *Spiel-houfes,* where there are mufic and dancing. They are much of the fame kind as the hops which were fo frequent about London. If ftrangers go there, they muft take care not to make their addreffes to a woman that is engaged to any other man.

There are two fuburbs to this city; one at the gate of the regulars; and the other goes as far as Overtoon, a village a little way from Amfterdam, where boats which come from Leyden are rolled over land upon wooden rollers. There is likewife in this city an hofpital for thofe that are infected with the plague; which was built in the year 1630, and has 360 windows.

This city is governed by a fenate or council, which confifts of 36 perfons, called a *Vroedfhap,* who enjoy their places for life; and when any of them dies, the remainder choofe another in his ftead. This fenate elects deputies to be fent to the States of Holland, and appoints the chief magiftrates of the city, called *Burgo-mafters*

Amsterdam *mafters* or *Echevins*, who are like our aldermen. The number is twelve; out of which four are chofen every year to execute the office, and are called *Burgomafters-regent*. Three of thefe are difcharged every year, to make room for three others. One of the four is kept in to inform the new ones of the ftate of affairs, and alfo prefides the three firft months in the year, and the others three months each; fo that, when they are in this office, they may be compared to the lord-mayor of the city of London. Thefe alterations and appointments are made by their own body. They difpofe of all inferior offices which become vacant during their regency. They have likewife the direction of all public works, which regard the fafety, tranquillity, and embellifhment of the city. The keys of the famous bank of this city are in the hands of thefe magiftrates.

The college confifts of new burgomafters or echevins, who are judges in all criminal affairs, without appeal; but in civil caufes they may appeal to the council of the province. There are two treafurers, a bailiff, and a penfionary. The bailiff continues in his office three years; and fearches after criminals, takes care to profecute them, and fees their fentence executed. The penfionary is the minifter of the magiftracy, is well verfed in the laws, makes public harangues, and is the defender of the interefts of the city. The city of Amfterdam contributes to the public income above 50,000 livres per day, befides the excife of beer, flefh, and corn; which in all amounts to above 1,600,000 l. a-year. This is more than is paid by all the reft of the provinces put together; and yet Amfterdam bears but the fifth rank in the affembly of the ftates of Holland, with this diftinction, that whereas other cities fend two members, this fends four.

The militia of Amfterdam is very confiderable. They have 60 companies, each of which has from 200 to 300 men. Jews and Anabaptifts are excluded from this fervice, not being admitted to bear arms: But they are obliged to contribute to the maintenance of the city-guard, which confifts of 1400 foldiers; as alfo to the night-watch, who patrole about the ftreets, and proclaim the hour. Befides thefe, there are trumpeters on every church fteeple, who found every half hour; and if there happens a fire, they ring the fire-bell, and fhow where it is. The inhabitants have excellent contrivances to extinguifh it fpeedily.

The trade of Amfterdam is prodigious: for almoft the whole trade of the Eaft India company centres in this city, which befides carries on a commerce with all the reft of the world, infomuch that it may be called the magazine or ftore-houfe of Europe. They import a vaft deal of corn from the Baltic, not fo much for prefent confumption, as to lay up againft times of fcarcity. The richeft fpices are entirely in the hands of the Eaft India company, who furnifh all Europe therewith. They have vaft quantities of military ftores, with which they fupply feveral nations; which is owing to their engroffing moft of the iron-works on the Rhine and other great rivers that run into Holland. The longitude of Amfterdam is 4. 30. E.; the latitude, 52. 25. N.

Amsterdam, is alfo the name of an ifland in the fouth-fea, faid to have been difcovered by Tafman a Dutch navigator. It was vifited by Captain Cook in his late voyages. Its greateft extent from eaft to weft is about 21 miles, and from north to fouth about 13. It is broad at the eaft end, and runs taper towards the weft, where it turns, and runs to a point due north. It is about fix leagues to the weft of Middleburgh. The fhore is furrounded by a coral rock, and its moft elevated parts are not above fix or eight yards above the level of the fea. S. Lat. 21. 11. W. Long. 175. It is wholly laid out in plantations, in which are cultivated fome of the richeft productions of nature. Amfterdam

Here are bread-fruit, cocoa-nut trees, plantains, bananas, fhaddocks, yams and fome other roots, fugar-canes, and a fruit like a nectarine called by the natives *fighega*. There did not appear an inch of wafte ground: the roads occupied no more fpace than was abfolutely neceffary: the fences did not take up above four inches each; and even thefe were not wholly loft, for in many grew fome ufeful trees or plants: it was every where the fame, change of place altered not the fcene: nature, affifted by a little art, nowhere appeared with more fplendor than on this ifland. Water is not fo plentiful here as at the Society-iflands; but the chief pointed out a pool of frefh water unafked, to fupply the fhips with that neceffary article. Cafuarinas, pandangs, and wild fago-palms, appear here with their various tints of green, and barringtoniæ as big as the loftieft oaks. The bread-fruit does not, however, thrive here with the fame luxuriance as at the Society-iflands; the coral rock, which compofes the bafis of this fpot, being much more thinly covered with mould.

Both men and women are of the common fize of Europeans, and their colour is that of a lightifh copper; they are well-fhaped, have regular features, are active, brifk, and lively. They have fine eyes, and in general good teeth, even to an advanced age. The women are the merrieft creatures imaginable, and inceffant talkers. In general, they appear to be modeft; although there was no want of thofe of a different ftamp. Among the natives, who fwam about the fhip very vociferoufly, were a confiderable number of women, who wantoned in the water like amphibious creatures, and were eafily perfuaded to come on board perfectly naked; but none of them ventured to ftay there after funfet, but returned to the fhore to pafs the night, like the greater part of the inhabitants, under the fhade of the wild wood which lined the coaft. There they lighted great fires, and were heard converfing almoft the whole night. The hair of both fexes in general is black, but efpecially that of the women; both fexes wear it fhort, except a fingle lock on the top of the head, and a fmall quantity on each fide. The men cut or fhave their beards quite clofe, which operation they perform with two fhells. The hair of many was obferved to be burnt at the ends, and ftrewed with a white powder, which was found, on examining it, to be lime made of fhell or coral, which had corroded or burnt the hair; fome made ufe of a blue powder, and others, both men and women, of an orange-coloured powder made of turmeric.

The drefs of both fexes confifts of a piece of cloth or matting wrapped round the waift, and hanging down below the knees. From the waift upwards they are generally naked, and it feems to be a cuftom to anoint thefe parts every morning. The practice of tattowing, or puncturing the fkin, likewife prevails. The men are tattowed from the middle of the thigh to above

above the hips; the women have it only on their arms and fingers, and on those parts but very slightly. Their ornaments are amulets, necklaces, and bracelets, the bone, shells, and beads of mother-of-pearl, tortoise-shell, &c. which are worn by men as well as women. The women also wear on their fingers neat rings made of tortoise-shell, and pieces in their ears about the size of a small quill: but here ornaments are not commonly worn, though all have their ears pierced. They have also a curious apron, made of the cocoa-nut shell, and composed of a number of small pieces sewed together in such a manner as to form stars, half-moons, little squares, &c.; it is studded with beads and shells, and covered with red feathers, so as to have a pleasing effect. They make the same kind of cloth, and of the same materials, as at O-Taheitee, though they have not such a variety, nor do they make any so fine; but as they have a method of glazing it, it is more durable, and will resist rain for some time, which the other cloth would not. Their colours are black, brown, yellow, purple, and red; all made from vegetables. They make various sorts of matting, some of a very fine texture, which is generally used for cloathing; and the thick and stronger sort serves to sleep upon, and to make sails for their canoes, &c. Among other useful utensils, they have various sorts of baskets, some made of the same materials as their mats, and others of the twisted fibres of cocoa-nuts. These are not only durable, but beautiful, being generally composed of different colours, and studded with beads made of shells or bones. They have many little nicknacks among them, which show that they neither want taste to design, nor skill to execute, whatever they take in hand. Their fishing implements are much the same as in other islands: here was purchased a fish-net made like our casting-nets, knit of very firm though slender threads.

Notwithstanding their very friendly disposition, these people have very formidable weapons; some of their spears have many barbs, and must be very dangerous weapons when they take effect. A large flat shell or breastplate was purchased, made of a roundish bone, white and polished like ivory, about 18 inches in diameter, which appeared to have belonged to an animal of the whale tribe.

AMULET, a charm, or preservative against mischief, witchcraft, or diseases.

Amulets were made of stone, metal, simples, animals, and in a word of every thing that imagination suggested.

Sometimes they consisted of words, characters, and sentences, ranged in a particular order, and engraved upon wood, *&c.* and worn about the neck, or some other part of the body. See Abracadabra.

At other times they were neither written nor engraved; but prepared with many superstitious ceremonies, great regard being usually paid to the influence of the stars. The Arabians have given to this species of amulet the name of talisman.

All nations have been fond of amulets: the Jews were extremely superstitious in the use of them, to drive away diseases; and the Misna forbids them, unless received from an approved man who had cured at least three persons before by the same means.

Among the Christians of the early times, amulets were made of the wood of the cross, or ribbands with a text of scripture written in them, as preservatives against diseases. Notwithstanding the progress of learning and refinement, there is not any country in Europe, even at this day, who do not believe in some charm or other. The pope is supposed to have the virtue of making amulets, which he exercises in the consecrating of *Agnus Dei's*, &c. The spunge which has wiped his table, was formerly in great veneration as a preservative from wounds, and from death itself: on this account it was sent with great solemnity by Gregory II. to the duke of Aquitain.

Amulets are now much fallen from the repute they were anciently in; yet the great Mr Boyle alleges them as an instance of the increase of external effluvia into the habit, in order to show the great porosity of the human body. He adds, that he is persuaded some of these external medicines do answer; for that he himself, having once been subject to bleed at the nose, and reduced to use several remedies to check it, found the moss of a dead man's skull, though only applied so as to touch the skin till the moss was warm thereby, the most effectual of any. The same Mr Boyle shows how the effluvia, even of cold amulets, may, in tract of time, pervade the pores of a living animal; by supposing an agreement between the pores of the skin and the figure of the corpuscles. Bellini has demonstrated the possibility of the thing in his last propositions *De Febribus*; and the like is done by Dr Wainwright, Dr Keill, &c.

AMURAT, or Amurath, I. the fourth emperor of the Turks, and one of the greatest princes of the Ottoman empire, succeeded Solyman in 1360. He took from the Greeks Gallipoli, Thrace, and Adrianople, which last he chose for the place of his residence. He defeated the prince of Bulgaria, conquered Misnia, chastised his rebellious bashaws, and is said to have gained 36 battles. This prince, in order to form a body of devoted troops that might serve as the immediate guards of his person and dignity, appointed his officers to seize annually, as the imperial property, the fifth part of the Christian youth taken in war. These, after being instructed in the Mahometan religion, inured to obedience by severe discipline, and trained to warlike exercises, were formed into a body distinguished by the name of *Janissaries*, or *New Soldiers*. Every sentiment which enthusiasm can inspire, every mark of distinction that the favour of the prince could confer, were employed in order to animate this body with martial ardour, and with a consciousness of its own pre-eminence. The Janissaries soon became the chief strength and pride of the Ottoman armies, and were distinguished above all the troops whose duty it was to attend on the person of the Sultan.—At length the death of Lazarus, despot of Servia, who had endeavoured in vain to stop the progress of Amurath's arms, touched Milo, one of his servants, in so sensible a manner, that, in revenge, he stabbed the sultan in the midst of his troops, and killed him upon the spot, A. D. 1389, after he had reigned 23 years.

Amurat II. the 10th emperor of the Turks, was the eldest son of Mahomet I. and succeeded his father in 1421. He besieged Constantinople and Belgrade without success; but he took Thessalonica from the Venetians, and compelled the prince of Bosnia and

and John Caſtriot prince of Albany to pay him tribute. He obliged the latter to ſend his three ſons as hoſtages; among whom was George, celebrated in hiſtory by the name of *Scanderbeg*. John Hunniades defeated Amurat's troops, and obliged him to make peace with the Chriſtian princes, in 1442. Theſe princes afterwards breaking the peace, Amurat defeated them in the famous battle of Varna, November 10th, 1444, which proved ſo fatal to the Chriſtians, and in which Ladiſlaus king of Hungary was killed. He afterwards defeated Hunniades, and killed above 20,000 of his men; but George Caſtriot, better known by the name of *Scanderbeg*, being re-eſtabliſhed in the eſtates of his father, defeated the Turks ſeveral times, and obliged Amurat to raiſe the ſiege of Croia, the capital of Albany. Amurat died, chagrined with his ill ſucceſs, and infirm with age, February 11th, 1451, at Adrianople. It is obſerved to this prince's honour, that he always kept his treaties with the greateſt fidelity.

AMYCLÆ, a city of Laconia, diſtant about 18 miles from the metropolis, founded by Amyclas the ſon of Lacedæmon, and famed afterwards for the birth of Caſtor and Pollux the ſons of Tydareus, eighth king of Sparta. It was afterwards famed for ſending a conſiderable colony of its own inhabitants into Upper Calabria, who built there a city which they called by the ſame name. This laſt city was ſituated between Caieta and Terracina, and gave its name to the neighbouring ſea. According to Pliny and Solinus, the territory of Amyclæ was ſo infeſted with vipers and other ſerpents, that the inhabitants were obliged to abandon their dwellings and ſettle elſewhere.—Among the ancient poets, the Amycli, or inhabitants of this city, obtained the epithet of *taciti* or *ſilent*. The reaſon of this was, either becauſe it was built by the Lacedæmonians, who, as they followed the doctrine of Pythagoras, were always inculcating the precept of ſilence, and thence called *taciti:* or becauſe of a law which obtained in this place, forbidding any one, under ſevere penalties, to mention the approach of an enemy. Before this law was made, the city was daily alarmed by falſe reports, as the enemy had been already at the gates. From terrors of this kind the abovementioned law indeed delivered them; but in the end it proved the ruin of the city: for the Dorians appearing unexpectedly under the walls, no one ventured to tranſgreſs the law; ſo that the city was eaſily taken. They reduced it to an inconſiderable hamlet; in which, however, were ſeen ſome of the remains of its ancient grandeur. One of the fineſt buildings that eſcaped the common ruin, was the temple and ſtatue of Alexandra, whom the inhabitants pretended to be the ſame with Caſſandra the daughter of Priam.

AMYGDALUS, the ALMOND and PEACH: a genus of the monogynia order, belonging to the icoſandria claſs of plants; and, in the natural method, ranking under the 36th order, *Pomaceæ*. The characters are: The *calyx* is a ſingle-leaved perianthium beneath, tubular, and quinquefid: The *corolla* conſiſts of five oblong petals, which are inſerted into the calyx: The *ſtamina* conſiſt of 30 ſlender erect filaments, half the length of the corolla, and inſerted into the calyx; the antheræ are ſimple: The *piſtillum* has a round villous germen above; a ſimple ſtylus, the length of the ſtamina; and the ſtigma headed: The *pericarpium* is a large roundiſh villous drupa, with a longitudinal furrow: The *ſeed* is an ovate compreſſed nut perforated in the pores.

Species. 1. The Communis, or Common Almond, a native of Africa, will grow to near 20 feet high; and whether planted ſingly in an open place, or mixed with others in clumps, ſhrubbery-quarters, &c. ſhows itſelf one of the fineſt flowering trees in nature. Thoſe who never yet ſaw it, may eaſily conceive what a noble appearance this tree muſt make, when covered all over with a bloom of a delicate red, which will be in March; a time when very few trees are ornamented either with leaves or flowers. No ornamental plantation, therefore, of what ſort or kind ſoever, ſhould be without almond-trees. Neither are the beauties of the flowers the only thing deſirable in this tree: The fruit would render it worthy of planting, were there no other motive. It ripens well, and its goodneſs is not unknown to us.—The white-flowering almond, well known in our nurſeries, is a variety of this ſpecies, and is cultivated for the ſake of the flowers and the fruit, though the flowers are inferior to the others; and unleſs it be ſet againſt a ſouth wall, in a well ſheltered place, there will be little hopes of bearing fruit.

2. The Nana, Dwarf Almond, is a native of Aſia Minor. Of this ſhrub there are two ſorts, the ſingle and the double. Both grow to about four or five feet high, and are in the firſt eſteem as flowering ſhrubs. The ſingle ſort has its beauties; but the double kind is matchleſs. In both the flowers are arranged the whole length of the laſt year's ſhoots; their colour is a delicate red; and they ſhow themſelves early in the ſpring, which ſtill enhances their value.

3. The Perſica, or Peach, is ſaid to be a native of Europe; but of what place is not known. Cultivation has produced many varieties of this fruit; of which the following are the moſt eſteemed.

1. The White Nutmeg.	15. The Bellegarde.
2. The Red Nutmeg.	16. The Bourdine.
3. The Early Purple.	17. The Roſſanna.
4. The Small Mignon.	18. The Admirable.
5. The White Magdalen.	19. The Old Newington.
6. The Yellow Alberge.	20. The Royal.
7. The Large French Mignon.	21. The Rambouillet.
	22. The Portugal.
8. The Beautiful Chevreuſe.	23. The Late Admirable.
	24. The Nivette.
9. The Red Magdalen.	25. Venus's Nipple.
10. The Chancellor.	26. The Late Purple.
11. Smith's Newington.	27. The Perſique.
12. The Montauban.	28. The Catharine.
13. The Malta.	29. The Monſtrous Pavy.
14. The Vineuſe.	30. The Bloody Peach.

The White Nutmeg is the firſt peach in ſeaſon, it being often in perfection by the end of July. The leaves are doubly ſerrated, the flower large, and of a pale colour; the fruit is white, ſmall, and round; the fleſh too is white, parts from the ſtone, and has a ſugary, muſky flavour.

The Red Nutmeg hath yellowiſh green leaves, with ſerpentine edges, which are ſlightly ſerrated. The flowers are large, open, and of a deep bluſh-colour. The fruit is larger and rounder than the former, and is of a bright vermilion next the ſun, but more yellow on the other ſide. The fleſh is white, except next the

Amygdalus stone, from which it separates, and has a rich musky flavour. It ripens just after the white nutmeg.

The Early Purple hath smooth leaves, terminated in a sharp point. The flowers are large, open, and of a lively red. The fruit is large, round, and covered with a fine deep red coloured down. The flesh is white, red next the stone, and full of a rich vinous juice. Ripe about the middle of August.

The Small Mignon hath leaves slightly serrated, and the flowers small and contracted. The peach is round, of a middling size, tinged with darkish red on the sun-side, and is of a pale yellowish colour on the other. The flesh is white, parts from the stone, where it is red, and contains plenty of a vinous, sugary juice. Ripens rather before the former.

The White Magdalen hath long, shining, pale-green leaves, deeply serrated on the edges, and the wood is mostly black at the pith. The flowers are large and open, appear early, and are of a pale red. The fruit is round, rather large, of a yellowish-white colour, except on the sunny side, where it is slightly streaked with red. The flesh is white to the stone, from which it separates, and the juice is pretty well flavoured. Ripe at the end of August.

The Yellow Alberge hath deep red, middle-sized flowers; the peach is smaller than the former, of a yellow colour on the shady side, and of a deep red on the other. The flesh is yellow, red at the stone, and the juice is sugary and vinous.

The Great French Mignon hath large, finely serrated leaves, and beautiful red flowers. The fruit is large, quite round, covered with a fine sattiny down, of a brownish red colour on the sunny side, and of a greenish yellow on the other. The flesh is white, easily parts from the skin, and is copiously stored with a sugary high-flavoured juice. Ripe near the middle of August.

The Beautiful Chevreuse hath plain leaves, and small contracted flowers. The fruit is rather oblong, of a middling size, of a fine red colour next the sun, but yellow on the other side. The flesh is yellowish, parts from the stone, and is full of a rich sugary juice. It ripens a little after the former.

The Red Magdalen hath deeply serrated leaves, and large open flowers. The fruit is large, round, and of a fine red next the sun. The flesh is firm, white, separates from the stone, where it is very red; the juice is sugary, and of an exquisite rich flavour. Ripe at the end of August.

The Chancellor hath large, slightly serrated leaves. The peach is about the size of the Beautiful Chevreuse, but rather rounder. The skin is very thin, of a fine red on the sunny side; the flesh is white and melting, parts from the stone, and the juice is very rich and sugary. It ripens with the former.

The leaves of Smith's Newington are serrated, and the flowers are large and open. The fruit is of a middle size, of a fine red on the sunny side; the flesh white and firm, but very red at the stone, to which it sticks closely, and the juice has a pretty good flavour. Ripens with the former.

The Montauban hath serrated leaves, and large open flowers. The fruit is about the size of the former, of a purplish red next the sun, but of a pale one on the shady side. The flesh is melting, and white even to the stone, from which it separates. The juice is rich, and well flavoured. It ripens a little before the former.

The Malta hath deeply serrated leaves, and the flowers are large and open. The fruit is almost round, of a fine red next the sun, marbled with a deeper red, but the shady side is of a deep green. The flesh is fine, white, except at the stone, from which it parts, where it is of a deep red; the juice is a little musky, and agreeable. It ripens at the end of August, or beginning of September.

The Vineuse hath large deep green leaves, and full bright red flowers. The fruit is round, of a middle size; the skin is thin, all over red; the flesh fine and white, except at the stone, where it is very red, and the juice is copious and vinous. Ripe in the middle of September.

The Bellegarde hath smooth leaves, and small contracted flowers. The fruit is very large, round, and of a deep purple colour next the sun. The flesh is white, parts from the stone, where it is of a deep red, and the juice is rich and excellent. It ripens early in September.

The Bourdine hath large, fine green, plain leaves, and small flesh-coloured contracted flowers. The fruit is round, of a dark red next the sun; the flesh white, except at the stone, where it is of a deep red, and the juice is rich and vinous. Ripens with the former.

The Rossanna hath plain leaves, and small contracted flowers. The fruit is rather longer than the alberge, and some count it only a variety of the latter. The flesh is yellow, and parts from the stone, where it is red; the juice is rich and vinous. Ripe early in September.

The Admirable hath plain leaves, and small contracted flowers, which are of a pale red. The fruit is very large and round; the flesh is firm, melting, and white, parts from the stone, and is there red; and the juice has a sweet, sugary, high vinous flavour. Ripe early in September,

The Old Newington hath serrated leaves, and large open flowers. The fruit is large, of a fine red next the sun; the flesh is white, sticks close to the stone, where it is of a deep red, and the juice has an excellent flavour. It ripens just after the former.

The Royal hath plain leaves, and small contracted flowers. The fruit is about the size of the admirable, and resembles it, except that it has sometimes a few knobs or warts. The flesh is white, melting, and full of a rich juice; it parts from the stone, and is there of a deep red. Ripe about the middle of September.

The Rambouillet hath leaves and flowers like the royal. The fruit is rather round than long, of a middling size, and deeply divided by a furrow. It is of a bright yellow on the shady side, but of a fine red on the other. The flesh is melting, yellow, parts from the stone, where it is of a deep red, and the juice is rich and vinous. Ripe with the former.

The Portugal hath plain leaves, and large open flowers. The fruit is large, spotted, and of a beautiful red on the sunny side. The flesh is firm, white, sticks to the stone, and is there red. The stone is small, deeply furrowed, and the juice is rich and sugary. Ripe towards the end of September.

The Late Admirable hath serrated leaves, and brownish

Amygdalus ifh red fmall contracted flowers. The fruit is rather large and round, of a bright red next the fun, marbled with a deeper. The flefh is of a greenifh-white, and fticks to the ftone, where it hath feveral red veins; the juice is rich and vinous. Ripe about the middle of September.

The Nivette hath ferrated leaves, and fmall contracted flowers. The fruit is large and roundifh, of a bright red colour next the fun, but of a pale yellow on the fhady-fide. The flefh is of a greenifh-yellow, parts from the ftone, where it is very red, and is copioufly ftored with a rich juice. It ripens about the middle of September.

Venus's Nipple hath finely ferrated leaves, and rofe-coloured, fmall contracted flowers, edged with carmine. The fruit is of a middling fize, and has a rifing like a breaft. It is of a faint red on the fun-fide, and on the fhady one of a ftraw-colour. The flefh is melting, white, feparates from the ftone, where it is red, and the juice is rich and fugary. Ripens late in September.

The Late Purple hath large, ferrated leaves, which are varioufly contorted, and the flowers are fmall and contracted. The fruit is round, large, of a dark red on the funny-fide, and yellowifh on the other. The flefh is melting, white, parts from the ftone, where it is red, and the juice is fweet and high-flavoured. Ripens with the former.

The Perfique hath large, very long indented leaves, and fmall contracted flowers. The fruit is large, oblong, of a fine red next the fun; the flefh firm, white, but red at the ftone, juicy, and of a high pleafant flavour. The ftalk has frequently a fmall knot upon it. Ripe late in September.

The Catharine hath plain leaves, and fmall flowers. The fruit is large, round, of a very dark red next the fun. The flefh white, firm, fticks clofe to the ftone, and is there of a deep red. The juice is rich and pleafant. It ripens early in October.

The Monftrous Pavy hath large, very flightly ferrated leaves, and large, but rather contracted flowers. The fruit is round, and very large, whence its name. It is of a fine red on the funny fide, and of a greenifh-white on the other. The flefh is white, melting, fticks clofe to the ftone, and is there of a deep red. It is pretty full of juice, which in dry feafons is fugary, vinous, and agreeable. Ripe towards the end of October.

The Bloody Peach hath rather large, ferrated leaves, which turn red in autumn. The fruit is of a middling fize, the fkin all over of a dull red, and the flefh is red down to the ftone. The fruit is but dry, and the juice rather fharp and bitterifh. It feldom ripens well in England, but is well worth cultivating notwithftanding, for the fruit bake and preferve excellent well.

The peach-tree has hitherto been planted againft walls for the fake of the fruit: "but, (fays Hanbury), as I hardly ever knew a perfon who was not ftruck with the beauty of the flowers when in full blow againft a wall, why fhould it not have a fhare in wildernefs-quarters and fhrubberies, amongft the forts of almonds, &c.? It may be kept down, or permitted to grow to the height of the owner's fancy; and the flowers are inferior to none of the other forts. Add to this, they frequently, in well-fheltered places, produce fruit which will be exceeding well-flavoured; and thus the owner may enjoy the benefit of a double treat." The above obfervations refpect the fingle peach; with regard to the double-flowered, it is generally propagated for ornamental plantations, and is univerfally acknowledged to be one of the fineft flowering-trees yet known. Againft a wall, however, thefe trees are always the faireft; and if they have this advantage, they are fucceeded by very good fruit.

The Nectarine, according to Linnæus, is only a variety of the peach, its having a fmooth coat being only an accident originally. Of this alfo many varieties are now cultivated; and the following are fome of the moft efteemed: 1. The Elruge. 2. The Newington. 3. The Scarlet. 4. The Roman. 5. The Murrey. 6. The Italian. 7. The Golden. 8. The Temple's.

The Elruge hath large ferrated leaves, and fmall flowers. The fruit is of a middling fize, of a dark purple colour next the fun, and of a greenifh yellow on the fhady fide. The flefh parts from the ftone, and has a foft, melting, good flavoured juice. Ripe early in Auguft.

The Newington hath ferrated leaves, and large open flowers. The fruit is pretty large, of a beautiful red on the funny fide, but of a bright yellow on the other. The flefh fticks to the ftone, is there of a deep red colour, and the juice has an excellent rich flavour. Ripe towards the end of Auguft.

The fcarlet is rather lefs than the former, of a fine fcarlet colour next the fun, but fades to a pale red on the fhady fide. It ripens near the time of the former.

The Roman, or clufter red nectarine, hath plain leaves, and large flowers. The fruit is large, of a deep red towards the fun, but yellowifh on the fhady fide. The flefh is firm, fticks to the ftone, and is there red; the juice is rich, and has an excellent flavour. Ripe about the end of Auguft.

The Murrey is a middling-fized fruit, of a dirty red colour on the funny fide, and yellowifh on the fhady one. The flefh is firm, and tolerably well flavoured. It ripens early in September.

The Italian Nectarine hath fmooth leaves and fmall flowers; the fruit is red next the fun, but yellowifh on the other fide; flefh firm, adheres to the ftone, where it is red, and when ripe, which is early in September, has an excellent flavour.

The Golden Nectarine has an agreeable red colour next the fun, bright yellow on the oppofite fide; flefh very yellow, fticks to the ftone, where it is of a pale red, has a rich flavour, and ripens in September.

Temple's Nectarine is of a middling fize, of a fair red next the fun, of a yellowifh green on the other fide; flefh white near the ftone, from which it feparates; ripens in September, and has a high poignant flavour.

Propagation, &c. All the above fpecies are propagated by inoculating them into plum-ftocks in Auguft. The ftocks fhould be firft planted in the nurfery when of the fize of a ftraw; and the firft or fecond fummer after they will be ready to receive the bud. The ufual method of inoculation muft be obferved, and there is no danger of fuccefs; though it may be proper to obferve, that the double-bloffomed peach fhould always be worked into the ftocks of the muffel-plum. The two forts of dwarf almond may alfo be propagated by layers, or from the fuckers, which they fometimes fend forth in great plenty.

Amygdalus

The varieties of the peach are produced like thofe of the finer flowers, by fowing the feeds; and though many raifed this way will be of little value, as is alfo the cafe of flowers, yet probably among a parcel of ftones, faved from the finer kinds of peaches, there would be fome new kinds produced; which, as they were raifed here, would be eafily kept up in their perfection, which is not to be expected of thofe brought from other countries. The beft method of faving the ftones is, to let fome of the fineft peaches of the beft kinds hang till they drop of themfelves from the tree, and then the ftones fhould be immediately planted on a bed of light dry earth, planting them about three inces deep in the earth, and at about four inches afunder. The beds fhould be covered to preferve them in the winter; and in fpring, when the plants come up, they muft be cleared of weeds, and well watered. The next fpring they fhould be carefully taken up, and planted in the nurfery, in rows three feet afunder, and one foot diftant from each other; laying a little mulch upon the furface of the ground about their roots, and in a dry fpring watering them once in a week; and after one or two years ftanding here, they may be removed to the places where they are to remain; or they may at that time, when the condition of their fruit is known, be grafted on other ftocks.

There are two general rules given for the pruning of peach and nectarine trees; viz. 1. Always to have enough of bearing wood; And, 2. Not to lay in the branches too clofe to one another. All peach trees produce their fruit from the young wood either of the fame, or at the moft of the former year's fhoot; for which reafon the branches are to be fo pruned, as to encourage them to throw out new fhoots in every part of the tree: and this is to be done in May; when by pinching, or ftopping the ftrong fhoots, there may be new wood forced out in any part of the tree. This is the method of the fummer pruning: the winter pruning is ufually done in February or March; but is much better done at Michaelmas, as foon as their leaves begin to fall; and the wounds will then have time to heal before the fevere frofts come on.

In pruning of thefe trees it muft always be obferved alfo, that it is beft done under a wood bud, not a bloffom bud; which may be diftinguifhed by the wood bud's being lefs turgid, and longer and narrower than the bloffom bud; for if the fhoot have not a leading bud where it is cut, it will commonly die down to the leading bud. In nailing the fhoots to the wall, they fhould be placed at as equal diftances as poffible; and fo far apart that the leaves may have room; and they muft always be trained as horizontally as poffible, that the lower part of the tree may be well wooded, which it will not be if the branches are fuffered to run upright. When the fruit is fet and grown to the fize of a fmall nut, it fhould be thinned, and left five or fix inches afunder: by this management the fruit will be larger and better tafted, and the trees in a condition to bear well the fucceeding year. The quantity of fruit to be left on large full grown trees fhould never be greater than five dozen upon each; but on middling trees, three or four dozen will be enough. If the feafon fhould prove hot and dry, it will be proper to draw up the earth round the ftem of each tree, to form a hollow bafon of about fix feet in diameter, and cover the furface of the ground in this bafon with mulch; and once in a week or fortnight, according to the drought of the feafon, to pour down eight or ten gallons of water to the root of each tree; or the water may be fprinkled by an engine over the branches of the trees, which, fhaking down to the roots, will promote the growth of the fruit and prevent its falling off the trees. This, however, fhould be continued only while the fruit is growing.

Amygdalus

The peach-tree, as well as the rofe-tree, are very fubject to be over-run with the aphides; which may be deftroyed by fumigating the houfe in which the plants are kept with tobacco, or, which is faid to be the moft effectual method, by fteam raifed from water poured over the flues†.—Soap-fuds are faid to deftroy effectually the different fpecies of infects that infeft fruit-trees growing againft walls, and particularly the peach, cherry, and plum. For this purpofe, a perfon on a ladder fhould pour them from a watering-pot over both trees and wall, beginning at the top of the wall, and bringing it on in courfes from top to bottom. The fuds contribute likewife, it is faid, to preferve the wood of the delicate and tender kinds of peaches.

† See *Kyle on Forcing Peaches*, &c.

Ufes. Sweet almonds are reckoned to afford little nourifhment; and, when eaten in fubftance, are not eafy of digeftion, unlefs thoroughly comminuted: Peeled, and eaten fix or eight at a time, they fometimes give prefent relief in the heart-burn. But in medicine they are moftly ufed for making emulfions; and they abound not only with an oil, but likewife with a mucilage fit for incorporating oil and water together.

Emulfions are commonly prepared from almonds, by beating an ounce of them, after being blanched, into a fine pulp, in a marble or ftone mortar; and triturating them well with half an ounce (more or lefs) of fine fugar; and then adding by little at a time, a quart of water; taking care to continue grinding them while the water is poured on; after which the white milky liquor is ftrained through a cloth, and put into a quart bottle. Some people add a dram of blanched bitter almonds to an ounce of the fweet, which they think make the emulfions more agreeable. Such emulfions have been much ufed as drink in acute difeafes, for diluting and blunting acrimonious juices in the firft paffages, and acrid faline particles in the blood; and for foftening and lubricating the fibres and membranes.

It has been a common practice to diffolve from half an ounce to an ounce, or more, of gum arabic in the water ufed for making the emulfions; and to make patients drink freely of them, while blifters are applied to the body, in order to prevent ftrangury; and to order them to be ufed in cafes of gravel, and of inflammation of the bladder or urethra; and in heat of urine from virulent gonorrhœa or other caufes.

Camphor, refin of jalap, and other refinous fubftances, by being triturated with almonds, become mifcible with water, and more mild and pleafant than they were before; and therefore they are frequently ordered to be rubbed with them, and made up into pills or bolufes, with the addition of fome conferve or gum arabic mucilage; or they are incorporated with watery liquors into the form of an emulfion.

Formerly

Amygdalus || Amyot.

Formerly the feeds of the lettuce, of the cucumber, of the white poppy, and of a number of other plants, were employed for making emulfions; but now in this country the fweet almonds fupply the place of all the reft.

The bitter almonds are not fo much ufed as they were formerly; becaufe they have been found to deftroy fome forts of animals: this effect was related by the ancients, but believed to be fictitious; becaufe when eaten by men they appear to be innocent, and to produce no deleterious effects. However, the facts related by Wepfer in his Treatife *de Cicuta Aquatica*, having been confirmed by later experiments; and it having been difcovered that a water drawn from them had deleterious effects, and that the diftilled water from the lauro-cerafus leaves, which have a bitter tafte refembling that of bitter almonds, was ftill more poifonous; it raifed a fufpicion of the wholefomenefs of thofe bitter fubftances, and has made phyficians more cautious of ufing them, though they have been employed for making orgeate and other liquors, without producing any bad effects.

As to the peach and nectarine, they are fufficiently known as delicious fruits. Peach-flowers have an agreeable fmell, and a bitterifh tafte: diftilled, without any addition, by the heat of a water-bath, they yield one-fixth their weight, or more, of a whitifh liquor, which, as Mr Bolduc obferves, communicates to a large quantity of other liquids a flavour like that of the kernels of fruits. An infufion in water of half an ounce of the frefh-gathered flowers, or a dram of them when dried, fweetened with fugar, proves for children an ufeful laxative and anthelmintic: the leaves of the tree are, with this intention, fomewhat more efficacious, though lefs agreeable. The fruit has the fame quality with the other fweet fruits, that of abating heat, quenching thirft, and gently loofening the belly.

AMYLACEOUS, from *amylum* "ftarch;" a term applied to the fine flour of farinaceous feeds, in which confifts their nutritive part. See BREAD.

AMYNTA, in literary hiftory, a beautiful paftoral comedy, compofed by Taffo; the model of all dramatic pieces wherein fhepherds are actors. The *Paftor Fido*, and *Filli di Sciro*, are only copies of this excellent piece.

AMYNTOR, αμυντωρ, formed of the verb αμυνω, *I defend*, or *avenge*, properly denotes a perfon who defends or vindicates a caufe. In this fenfe, Mr Toland intitles his defence of Milton's life, *Amyntor*, as being a vindication of that work againft Mr Blackhall and others, who had charged him with queftioning the authority of fome of the books of the New Teftament, and declaring his doubt that feveral pieces under the name of Chrift and his apoftles, received now by the whole Chriftian church, were fuppofititious.

AMYOT (James), bifhop of Auxerre and great almoner of France, was born of an obfcure family at Melun, the 30th of October 1514, and ftudied philofophy at Paris, in the college of Cardinal Le Moine. He was naturally dull and heavy; but diligence and application made amends for thefe natural defects. He left Paris at the age of twenty-three; and went to Bourges with the Sieur Colin, who had the abbey of St Ambrofe in that city. At the recommendation of this abbot, a fecretary of ftate took Amyot into his houfe to be tutor to his children. The great improvements they made under his direction induced the fecretary to recommend him to the princefs Margaret duchefs of Berry, only fifter of Francis I. and by means of this recommendation Amyot was made public profeffor of Greek and Latin in the univerfity of Bourges. It was during this time he tranflated into French the "Amours of Theagines and Chariclea," which Francis I. was fo pleafed with, that he conferred upon him the abbey of Bellofane. He alfo tranflated Plutarch's Lives, which he dedicated to the king; and afterwards undertook that of Plutarch's Morals, which he ended in the reign of Charles IX. and dedicated to that prince. Charles conferred upon him the abbey of St Cornelius de Compiegne, and made him great almoner of France and bifhop of Auxerre. He died in 1593, aged 79.

Amyraldifm || Amyris.

AMYRALDISM, a name given by fome writers to the doctrine of univerfal grace, as explained and afferted by Amyraldus, or Mofes Amyrault, and others his followers, among the reformed in France, towards the middle of the 17th century.

This doctrine principally confifted of the following particulars, viz. that God *defires* the happinefs of all men, and none are excluded by a divine decree; that none can obtain falvation without faith in Chrift; that God refufes to none the *power* of *believing*, though he does not grant to *all* his affiftance, that they may improve this power to faving purpofes; and that many perifh through their own fault. Thofe who embraced this doctrine were called *Univerfalifts*; though it is evident they rendered grace *univerfal* in words, but *partial* in reality, and are chargeable with greater inconfiftences than the *Supralapfarians*.

AMYRAULT (Mofes), an eminent French Proteftant divine, born at Bourgueil in Touraine in 1596. He ftudied at Saumur, where he was chofen profeffor of theology; and his learned works gained him the efteem of Catholics as well as Proteftants, particularly of Cardinal Richelieu, who confulted him on a plan of reuniting their churches, which however, as may well be fuppofed, came to nothing. He publifhed a piece in which he attempted to explain the myftery of predeftination and grace, which occafioned a controverfy between him and fome other divines. He alfo wrote, An Apology for the Proteftants; a Paraphrafe on the New Teftament; and feveral other books. This eminent divine died in 1664.

AMYRIS: A genus of the monogynia order, belonging to the decandria clafs of plants. The characters are: The *calyx* is a fmall fingle-leaved perianthium, four-toothed and perfiftent: The *corolla* confifts of four oblong petals, concave and expanding: The *ftamina* confift of eight erect fubulated filaments; the antheræ are oblong, erect, and the length of the corolla: The *piftillum* has an ovate germen, above; a thickifh ftylus, the length of the ftamina; and a four-cornered ftigma: The *pericarpium* is a round drupaceous berry: The *feed* is a globular gloffy nut.—The moft remarkable fpecies are: 1. The elemifera, or fhrub which bears the gum elemi, a native of South America. It grows to the height of about fix feet, producing trifoliated ftiff fhining leaves, growing oppofite to one another on footftalks two inches long. At the ends of the branches grow four or five flender ftalks fet with many very

Plate XV.

very ſmall white flowers. 2. The gileadenſis, or opobalſamum, is an evergreen ſhrub, growing ſpontaneouſly in Arabia Felix, from whence the opobalſam, or balm of gilead, is procured. 3. Toxifera, or poiſon-wood, is a ſmall tree, with a ſmooth light-coloured bark. Its leaves are winged; the middle rib is ſeven or eight inches long, with pairs of pinnæ one againſt another on inch-long footſtalks. The fruit hangs in bunches, is ſhaped like a pear, and is of a purple colour, covering an oblong hard ſtone. From the trunk of this tree diſtils a liquid as black as ink. Birds feed on the fruit; particularly one, called the *purple groſsbeak*, on the mucilage that covers the ſtone. It grows uſually on rocks, in Providence, Ilathera, and others of the Bahama iſlands. 4. The balſamifera, or roſewood, is found on gravelly hills in Jamaica and others of the Weſt India iſlands. It riſes to a conſiderable height, and the trunks are remarkable for having large protuberances on them. The leaves are laurel-ſhaped; the ſmall blue flowers are on a branched ſpike; and the berries are ſmall and black.

Properties. From the firſt ſpecies, which is called by the natives of the Braſils *icicariba*, is obtained the reſin improperly called *gum elemi*, or gum lemon. This drug is brought to us from the Spaniſh Weſt Indies, and ſometimes from the Eaſt Indies, in long roundiſh cakes, generally wrapped up in flag leaves. The beſt ſort is ſoftiſh, ſomewhat tranſparent, of a pale whitiſh yellow colour, inclining a little to green, of a ſtrong not unpleaſant ſmell. It almoſt totally diſſolves in pure ſpirit, and ſends over ſome part of its fragrance along with this menſtruum in diſtillation: diſtilled with water, it yields a conſiderable quantity of pale coloured, thin, fragrant eſſential oil. This reſin gives name to one of the officinal unguents, and is at preſent ſcarce any otherwiſe made uſe of; though it is certainly preferable, for internal purpoſes, to ſome others which are held in greater eſteem. The ſecond ſpecies yields the balſam of Mecca, of Syria, or of Gilead, which is the moſt fragrant and pleaſant of any of the balſams. The true balſam tree is found near to Mecca, which is ſituated about a day's journey from the Red Sea, on the Aſiatic ſide. It has a yellowiſh or greeniſh yellow colour, a warm bitteriſh aromatic taſte, and an acidulous fragrant ſmell. It has long been held in great eſteem. The Turks, who are in poſſeſſion of the country in which it grows, value it much as an odoriferous unguent and coſmetic, and ſet ſuch a high price upon it, that it is adulterated when it comes into the hands of the dealers, ſo that it is very difficult to get genuine ſpecimens of it, and therefore it is very ſeldom uſed in this country: it has been recommended in great variety of complaints; but now it is generally believed that the Canada and copiava balſams are equally efficacious, and will anſwer every purpoſe for which it can be uſed. Dr Alſton ſays, that the ſureſt mark of this balſam being pure and unadulterated is, its ſpreading quickly on the ſurface of water when dropped into it; and that if a ſingle drop of it is let fall into a large ſaucer full of water, it immediately ſpreads all over its ſurface, and as it were diſſolves and diſappears; but in about half an hour it becomes a tranſparent pellicle covering the whole ſurface, and may be taken up with a pin, having loſt both its fluidity and colour, and become white and ſoft, cohering, and communicating its ſmell and taſte to the water. This teſt, he ſays, all the balſam he ſaw in Holland bore, though it is rare to get any from London that anſwers it. The balſamifera, or roſe-wood, affords an excellent timber: it is alſo replete with a fragrant balſam or oil, and retains its flavour and ſolidity though expoſed to the weather many years. By ſubjecting this wood to diſtillation, Dr Wright thinks, a perfume equal to the oleum rhodii may probably be obtained.

ANA, among phyſicians, denotes a quantity equal to that of the preceding ingredient. It is abbreviated thus, āā, or ā.

ANA, in matters of literature, a Latin termination, adopted into the titles of ſeveral books in other languages.—*Anas*, or *books in ana*, are collections of the memorable ſayings of perſons of learning and wit; much the ſame with what we otherwiſe call *table-talk*.

Wolfius has given the hiſtory of books in ana, in the preface to the Caſauboniana. He there obſerves, that though ſuch titles be new, the thing itſelf is very old; that Xenophon's books of the deeds and ſayings of Socrates, as well as the dialogues of Plato, are *Socratiana*; that the apophthegms of the philoſophers collected by Diogenes Laertius, the ſentences of Pythagoras and thoſe of Epictetus, the works of Athenæus, Stobeus, and divers others, are ſo many anas. Even the Gemara of the Jews, with ſeveral other oriental writings, according to Wolfius, properly belong to the ſame claſs. To this head of ana may likewiſe be referred the Orphica, the Pythagoræa, Æſopica, Pyrrhonea, &c.

Scaligerana was the firſt piece that appeared with a title in ana. It was compoſed by Iſan de Vaſſan, a young Champanois, recommended to Joſ. Scaliger by Caſaubon. Being much with Scaliger, who was daily viſited by the men of learning at Leyden, De Vaſſan wrote down whatever things of any moment he heard Scaliger ſay. And thus aroſe the Scaligerana, which was not printed till many years after, at Geneva in 1666. Patin. Let. 431.—Soon after came the Perroniana, Thuana, Naudæana, Patineana, Sorberiana, Menagiana, Anti-Menagiana, Furetiana, Chevræana, Leibnitziana, Arlequiniana, Poggiana, &c.

ANABAPTISTON, the ſame with ABAPTISTON.

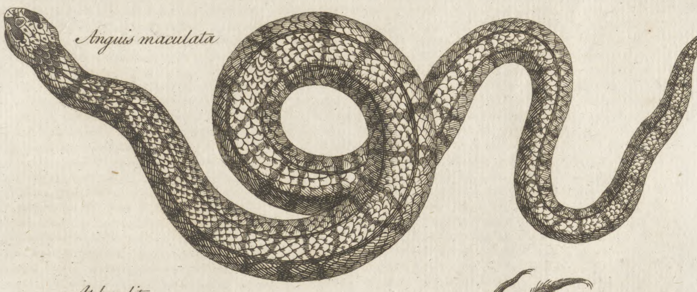
ANABAPTISTS, a name which has been indiſcriminately applied to Chriſtians of very different principles and practices; though many of them object to the denomination, and hold nothing in common, beſides the opinion that baptiſm ought always to be performed by immerſion, and not adminiſtered before the age of diſcretion.

The word Anabaptiſt is compounded of ανα, "new," and βαπτιστης, "a baptiſt;" and in this ſenſe the Novatians, the Cataphrygians, and the Donatiſts, may be conſidered as a kind of Anabaptiſts in the earlier ages, though not then denoted by this name; for they contended, that thoſe Chriſtians of the catholic church who joined themſelves to their reſpective parties ſhould be rebaptized. But we muſt not claſs under the ſame denomination thoſe biſhops of Aſia and Africa, who, in the third century, maintained, that baptiſm adminiſtered by thoſe whom they called heretics was not valid, and therefore that ſuch of them as returned into their churches ought to be rebaptized. Nor do the

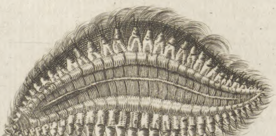
English

Plate XV.

Amyris elemifera



Anguis maculata



Aphrodita

Aranea tarantula

A. Bell Prin. Wal. Sculptor fecit.

Anabaptists English and Dutch Baptists consider the denomination as at all applicable to their sect: by whom the baptism appointed by Christ is held to be "nothing short of *immersion, upon a personal profession of faith*;" of which profession infants being incapable, and sprinkling being no adequate symbol of the thing intended, the baptizing of proselytes to their communion, who in their infancy had undergone the ceremony of sprinkling, cannot, it is urged, be interpreted a repetition of the baptismal ordinance.

Anabaptists, in a strict and proper sense, appear to be those who not only rebaptize, when they arrive at an adult age, persons that were baptised in their infancy, but also, as often as any person comes from one of their sects to another, or as often as any one is excluded from their communion and again received into the bosom of their church, they baptize him. And such were many of the German Baptists. But the single opinion common to all the sects to which the name of *Anabaptists* has been indiscriminately applied, is that of the invalidity of *infant baptism*, in whatever way administered: And hence the general denomination of *Antipædobaptists*; which includes Anabaptists, Baptists, Mennonites, Waterlandians, &c. as distinguished by their respective peculiarities; though *Anabaptists* seem to have been adopted by most writers as the general term.

To the above peculiar notion concerning the baptismal sacrament, the Anabaptists added principles of a different nature, depending upon certain ideas which they entertained concerning a perfect church-establishment, pure in its members, and free from the institutions of human policy.

The Anabaptists appear to have made little noise, or to have been little noticed, before the time of the reformation in Germany. The most prudent and rational part of them considered it possible, by human wisdom, industry, and vigilance, to purify the church from the contagion of the wicked, provided the manners and spirit of the primitive Christians could but recover their lost dignity and lustre; and seeing the attempts of Luther, seconded by several persons of eminent piety, prove so successful, they hoped that the happy period was arrived in which the restoration of the church to purity was to be accomplished, under the divine protection, by the labours and counsels of pious and eminent men. Others, far from being satisfied with the plan of reformation proposed by Luther, looked upon it as much beneath the sublimity of their views; and consequently undertook a more perfect reformation, or, to express more properly their visionary enterprise, they proposed to found a new church, entirely spiritual, and truly divine.

This sect was soon joined by great numbers, and (as usually happens in sudden revolutions of this nature) by many persons, whose characters and capacities were very different, though their views seemed to turn upon the same object. Their progress was rapid; for, in a very short space of time, their discourses, visions, and predictions, excited commotions in a great part of Europe, and drew into their communion a prodigious multitude, whose ignorance rendered them easy victims to the illusions of enthusiasm. The most pernicious faction of all those which composed this motley multitude, was that which pretended that the founders of the new and *perfect church*, already mentioned, were under the direction of a divine impulse, and were armed against all opposition by the power of working miracles. It was this faction that, in the year 1521, began their fanatical work, under the guidance of Munzer, Stubner, Storck, &c.

These persons were disciples of Luther; but well knowing that their opinions were such as would receive no sanction from him, they availed themselves of his absence to disseminate them in Wittemburgh, and had the address to over-reach the piety of Melancthon. Their principal purpose was to gain over the populace, and to form a considerable party. To effect this, says Bayle, they were industrious and active, each in his own way. Storck wanting knowledge, boasted of inspiration; and Stubner, who had both genius and erudition, laboured at commodious explications of Scripture. Not content with discrediting the court of Rome, and decrying the authority of consistories, they taught, That among Christians, who had the precepts of the gospel to direct and the Spirit of God to guide them, the office of magistracy was not only unnecessary, but an unlawful encroachment on their spiritual liberty; that the distinctions occasioned by birth, or rank, or wealth, being contrary to the spirit of the gospel, which considers all men as equal, should be entirely abolished; that all Christians, throwing their possessions into one common stock, should live together in that state of equality which becomes members of the same family; that as neither the laws of nature nor the precepts of the New Testament had placed any restraint upon men with regard to the number of wives which they might marry, they should use that liberty which God himself had granted to the patriarchs.

They employed at first the various arts of persuasion in order to propagate their doctrine. They preached, exhorted, admonished, and reasoned, in a manner that seemed proper to impress the multitude; and related a great number of visions and revelations with which they pretended to have been favoured from above. But when they saw that these methods of making proselytes were not attended with such a rapid success as they fondly expected, and that the ministry of Luther and other eminent reformers were detrimental to their cause, they then had recourse to more expeditious measures, and madly attempted to propagate their fanatical doctrine by force of arms. Munzer and his associates, in the year 1525, put themselves at the head of a numerous army, composed for the most part of the peasants of Suabia, Thuringia, Franconia, and Saxony, and declared war against all laws, government, and magistrates of every kind, under the chimerical pretext that Christ was now to take the reins of civil and ecclesiastical government into his own hands, and to rule alone over the nations. But this seditious crowd was routed and dispersed, without much difficulty, by the Elector of Saxony and other princes; and Munzer their ringleader ignominiously put to death, and his factious counsellors scattered abroad in different places.

Many of his followers, however, survived, and propagated their opinions through Germany, Switzerland, and Holland. In the year 1533, a party of them settled at Munster under the direction of two Anabaptist prophets, John Matthias a baker of Haerlem, and John Bockholdt a journeyman taylor of Leyden. Having

ving made themselves masters of the city, they deposed the magistrates, confiscated the estates of such as had escaped, and deposited the wealth they amassed together in a public treasury for common use. They made preparations of every kind for the defence of the city; and sent out emissaries to the Anabaptists in the Low Countries, inviting them to assemble at Munster, which was now dignified with the name of Mount Sion, that from hence they might be deputed to reduce all the nations of the earth under their dominion. Matthias, who was the first in command, was soon cut off in an act of phrensy by the bishop of Munster's army; and was succeeded by Bockholdt, who was proclaimed by a special designation of Heaven, as he pretended, king of Sion, and invested with legislative powers like those of Moses. The extravagances of Bockholdt were too numerous to be recited: it will be sufficient to add, that the city of Munster was taken after a long siege and an obstinate resistance; and Bockholdt the mock monarch was punished with a most painful and ignominious death.

It must, however, be acknowledged, that the true rise of the numerous insurrections of this period ought not to be attributed to religious opinions. The first insurgents groaned under the most grievous oppressions; they took up arms principally in defence of their civil liberties; and of the commotions that took place. The Anabaptist leaders above mentioned seem rather to have availed themselves, than to have been the prime movers. See the article REFORMATION.—That a great part of the main body, indeed, consisted of Anabaptists seems indisputable; and whatever fanaticism existed among them would naturally be called forth or be inflamed by the situations that occurred, and run riot in its wildest shapes. At the same time it appears from history, that a great part also consisted of Roman Catholics, and a still greater of persons who had scarcely any religious principles at all. Indeed, when we read of the vast numbers that were concerned in those insurrections, of whom it is reported that 100,000 fell by the sword, it appears reasonable to conclude that a great majority of them were not Anabaptists.

Before concluding this article, it must be remarked, that the Baptists or Mennonites in England and Holland are to be considered in a very different light from the enthusiasts we have been describing: And it appears equally uncandid and invidious, to trace up their distinguishing sentiment, as some of their adversaries have done, to those obnoxious characters, and there to stop, in order as it were to associate with it the ideas of turbulence and fanaticism, with which it certainly has no natural connection. Their coincidence with some of those oppressed and infatuated people in denying baptism to infants, is acknowledged by the Baptists: but they disavow the practice which the appellation of *Anabaptists* implies; and their doctrines seem referable to a more ancient and respectable origin. They appear supported by history in considering themselves as the descendants of the Waldenses, who were so grievously oppressed and persecuted by the despotic heads of the Romish hierarchy; and they profess an equal aversion to all principles of rebellion on one hand, and to all suggestions of fanaticism on the other. See BAPTISTS.—The denomination of *Mennonites*, by which they are distinguished in Holland, they derive from Menno, the famous man who latterly gave consistence and stability to their sect: See MENNONITES.

ANABASII, in antiquity, were couriers who were sent on horseback, or in chariots, with dispatches of importance.

ANABATHRA, in ancient writers, denote a kind of steps or ladder whereby to ascend to some eminence. In this sense we read of the anabathra of theatres, pulpits, &c. Anabathra appears to have been sometimes also applied to ranges of seats rising gradually over each other.

ANABATHRA is more particularly applied to a kind of stone blocks raised by the highway sides, to assist travellers in mounting or alighting, before the use of stirrups was invented.—The first author of this contrivance among the Romans was C. Gracchus brother of Tiberius.

ANABLEPS, in ichthyology, the trivial name of a species of cobitis. See COBITIS.

ANABOA, a small island situated near the coast of Loango in Africa, in E. Long. 9°. N. Lat. 1°. Here are several fertile valleys, which produce plenty of bananas, oranges, pine-apples, lemons, citrons, tamarinds, cocoa nuts, &c. together with vast quantities of cotton. In this island are two high mountains, which, being continually covered with clouds, occasion frequent rains.

ANABOLÆUM, or ANABOLE, in antiquity, a kind of great or upper coat, worn over the tunica.

ANABOLEUS, in antiquity, an appellation given to grooms of the stable, or equerries, who assisted their masters in mounting their horses. As the ancients had no stirrups, or instruments that are now in use for mounting a horse, they either jumped upon his back, or were aided in mounting by anabolei.

ANACALYPTERIA, according to Suidas, were presents made to the bride by her husband's relations and friends when she first uncovered her face and showed herself to men. These presents were also called επαυλαια: for, among the Greeks, virgins before marriage were under strict confinement, being rarely permitted to appear in public, or converse with the other sex; and when allowed that liberty, wore a veil over their faces, termed Καλυπτρον, or Καλυπτρα, which was not left off in the presence of men till the third day after marriage; whence, according to Hesychius, this day was also called *anacalypterion*.

ANACAMPSEROS, in botany, a synonime of the portulaca and several other plants.

ANACAMPTERIA, in ecclesiastical antiquity, a kind of little edifices adjacent to the churches, designed for the entertainment of strangers and poor persons.

ANACAMPTIC, a name applied by the ancients to that part of optics which treats of reflection, being the same with what is now called CATOPTRICS.

ANACARDIUM, or CASHEW-NUT TREE: A genus of the monogynia order, belonging to the decandria class of plants; and in the natural method ranking under the 12th order, *Holoraceæ*. The characters are: The *calyx* is divided into five parts, the divisions ovate and deciduous: The *corolla* consists of five reflected petals, twice the length of the calyx: The *stamina* consist of ten capillary filaments shorter than the calyx, one of them castrated; the antheræ are small and

Plate XVI.


Anacardium occidentale
Alauda
New Zealand Lark
Amphisbæna
A.Bell Prin. Wal. Sculptor fecit

and roundiſh: The *piſtillum* has a roundiſh germen; the ſtylus is ſubulated, inflected, and the length of the corolla; the ſtigma oblique: There is no *pericarpium;* the receptaculum is very large and fleſhy: The *ſeed* is a large kidney-ſhaped nut, placed above the receptaculum.

Of this only one ſpecies is as yet known to the botaniſts, viz. the occidentale. It grows naturally in the Weſt Indies, and arrives at the height of 20 feet in thoſe places of which it is a native, but cannot be preſerved in Britain without the greateſt difficulty. The fruit of this tree is as large as an orange; and is full of an acid juice, which is frequently made uſe of in making punch. To the apex of this fruit grows a nut, of the ſize and ſhape of a hare's kidney, but much larger at the end which is next the fruit than at the other. The ſhell is very hard; and the kernel, which is ſweet and pleaſant, is covered with a thin film. Between this and the ſhell is lodged a thick, blackiſh, inflammable liquor, of ſuch a cauſtic nature in the freſh nuts, that if the lips chance to touch it, bliſters will immediately follow. The kernels are eaten raw, roaſted, or pickled. The cauſtic liquor juſt mentioned is eſteemed an excellent coſmetic with the Weſt India young ladies, but they muſt certainly ſuffer a great deal of pain in its application; and as fond as our Britiſh females are of a beautiful face, it is highly probable they would never ſubmit to be flayed alive to obtain one. When any of the former fancy themſelves too much tanned by the ſcorching rays of the ſun, they gently ſcrape off the thin outſide of the ſtone, and then rub their faces all over with the ſtone. Their faces immediately ſwell and grow black; and the ſkin being poiſoned by the cauſtic oil above mentioned, will, in the ſpace of five or ſix days, come entirely off in large flakes, ſo that they cannot appear in public in leſs than a fortnight; by which time the new ſkin looks as fair as that of a new-born child. The negroes in Brazil cure themſelves effectually of diſorders in the ſtomach by eating of the yellow fruit of this tree; the juice of which, being acid, cuts the thick tough humours which obſtructed the free circulation of the blood, and thus removes the complaint. This cure, however, is not voluntary: for their maſters, the Portugueſe, deny them any other ſuſtenance; and letting them looſe to the woods, where the caſhew-nuts grow in great abundance, leave it in their option to periſh by famine or ſuſtain themſelves with this fruit.—The milky juice of this tree will ſtain linen of a good black, which cannot be waſhed out. See Plate XVI.

Culture. This plant is eaſily raiſed from the nuts, which ſhould be planted each in a ſeparate pot filled with light ſandy earth, and plunged into a good hot-bed of tanners bark; they muſt alſo be kept from moiſture till the plants come up, otherwiſe the nuts are apt to rot. If the nuts are freſh, the plants will come up in about a month; and in two months more, they will be four or five inches high, with large leaves: from which quick progreſs many people have been deceived, imagining they would continue the like quick growth afterwards; but with all the care that can be taken, they never exceed the height of two feet and an half, and for the moſt part ſcarce half as much.

ANACEPHALÆOSIS, in rhetoric, the ſame with recapitulation. See RECAPITULATION.

ANACHARSIS, a famous Scythian philoſopher, converſed with Solon, and lived an auſtere life. Upon his return from his travels through Greece, he attempted to change the ancient cuſtoms of Scythia, and to eſtabliſh thoſe of Greece; which proved fatal to him. The king ſhot him dead in a wood with an arrow. A great many ſtatues were erected to him after his death. He is ſaid to have invented tinder, the anchor, and the potter's wheel; but the latter is mentioned by Homer, who lived long before him. Anacharſis flouriſhed in the time of Crœſus.

ANACHORET, in church-hiſtory, denotes a hermit, or ſolitary monk, who retires from the ſociety of mankind into ſome deſart, with a view to avoid the temptations of the world, and to be more at leiſure for meditation and prayer. Such were Paul, Anthony, and Hilarion, the firſt founders of monaſtic life in Egypt and Paleſtine.

Anachorets, among the Greeks, conſiſt principally of monks, who retire to caves or cells, with the leave of the abbot, and an allowance from the monaſtery; or who, weary of the fatigues of the monaſtery, purchaſe a ſpot of ground, to which they retreat, never appearing again in the monaſtery, unleſs on ſolemn occaſions.

ANACHRONISM, in matters of literature, an error with reſpect to chronology, whereby an event is placed earlier than it really happened.—The word is compounded of ανα, "higher," and χρονος, "time." Such is that of Virgil, who placed Dido in Africa at the time of Æneas, though in reality ſhe did not come there till 300 years after the taking of Troy.—An error on the other ſide, whereby a fact is placed later and lower than it ſhould be, is called a *parachroniſm.*

ANACLASTIC GLASSES, a kind of ſonorous phials, or glaſſes, chiefly made in Germany, which have the property of being flexible; and emitting a vehement noiſe by the human breath.—They are alſo called *vexing glaſſes* by the Germans (*vexier glaſer*), on account of the fright and diſturbance they occaſion by their reſilition.—The anaclaſtic glaſſes are a low kind of phials with flat bellies, reſembling inverted funnels, whoſe bottoms are very thin, ſcarce ſurpaſſing the thickneſs of an onion peel: this bottom is not quite flat, but a little convex. But upon applying the mouth to the orifice, and gently inſpiring, or as it were ſucking out the air, the bottom gives way with a prodigious crack, and of convex becomes concave. On the contrary, upon exſpiring or breathing gently into the orifice of the ſame glaſs, the bottom with no leſs noiſe bounds back to its former place, and becomes gibbous as before.—The anaclaſtic glaſſes firſt taken notice of were in the caſtle of Goldbach; where one of the academiſts *Naturæ Curioſorum*, having ſeen and made experiments on them, publiſhed a piece expreſs on their hiſtory and phenomena. They are all made of a fine white glaſs. It is to be obſerved in theſe, 1. That if the bottom be concave at the time of inſpiration, it will burſt; and the like will happen if it be convex at the time of exſpiration. 2. A ſtrong breath will have the ſame effect even under the contrary circumſtances.

ANACLASTICS, that part of optics which conſiders

fiders the refraction of light, and is commonly called *Dioptrics*. See Dioptrics.

ANACLETERIA, in antiquity, a folemn feftival celebrated by the ancients when their kings or princes came of age, and affumed the reins of government. It is fo called, becaufe proclamation being made of this event to the people, they went to falute their prince during the anacleteria, and to congratulate him upon his new dignity.

ANACLETICUM, in the ancient art of war, a particular blaft of the trumpet, whereby the fearful and flying-foldiers were rallied, and recalled to the combat.

ANACLINOPALE, Ανακλινοπαλη, in antiquity, a kind of wreftling, wherein the champions threw themfelves voluntarily on the ground, and continued the combat by pinching, biting, fcratching, and other methods of offence. The *Anaclinopale* was contradiftinguifhed from the *Orthopale*, wherein the champions ftood erect. In the *Anaclinopale*, the weaker combatants fometimes gained the victory.

ANACLINTERIA, in antiquity, a kind of pillows on the dining-bed, whereon the guefts ufed to lean. The ancient tricliniary beds had four pillows, one at the head, another at the feet, a third at the back, and a fourth at the breaft. That on which the head lay, was properly called by the Greeks ανακλιντηριον, or ανακλιντρον; by the Romans *fulcrum*, fometimes *pluteus*.

ANACOLLEMA, a compofition of aftringent powders, applied by the ancients to the head, to prevent defluctions on the eyes.

ANACONDO, in natural hiftory, is a name given in the ifle of Ceylon to a very large and terrible rattle-fnake, which often devours the unfortunate traveller alive, and is itfelf accounted excellent and delicious fare.

ANACREON, a Greek poet, born at Teos, a city of Ionia, flourifhed about 532 years before the Chriftian æra. Polycrates, tyrant of Samos, invited him to his court, and made him fhare with him in his bufinefs and his pleafures. He had a delicate wit, as may be judged from the inexpreffible beauties and graces that fhine in his works: but he was fond of pleafure, was of an amorous difpofition, and addicted to drunkennefs: yet, notwithftanding his debaucheries, he lived to the age of 85; when, we are told, he was choaked by a grape-ftone which ftuck in his throat as he was regaling on fome new wine.

There is but a fmall part of Anacreon's works that remain; for, befides his odes and epigrams, he compofed elegies, hymns, and iambics. His poems which are extant were refcued from oblivion by Henry Stephens, and are univerfally admired. The verfes of Anacreon are fweeter, fays Scaliger, than Indian fugar. His beauty and chief excellence, fays Madam Dacier, lay in imitating nature, and in following reafon; fo that he prefented to the mind no images but what were noble and natural. The odes of Anacreon, fays Rapin, are flowers, beauties, and perpetual graces; it is familiar to him to write what is natural and to the life, he having an air fo delicate, fo eafy, and graceful, that among all the ancients there is nothing comparable to the method he took, nor to that kind of writing he followed. He flows foft and eafy, every where diffufing the joy and indolence of his mind thro' his verfe, and tuning his harp to the fmooth and pleafant temper of his foul. But none has given a jufter character of his writings than the God of Love, as taught to fpeak by Mr Cowley:

> All thy verfe is fofter far
> Than the downy feathers are,
> Of my wings, or of my arrows,
> Of my mother's doves and fparrows:
> Graceful, cleanly, fmooth, or round,
> All with Venus' girdle bound.

ANACREONTIC verse, in ancient poetry, a kind of verfe, fo called from its being much ufed by the poet Anacreon. It confifts of three feet and an half, ufually fpondees and iambufes, and fometimes anapefts: Such is that of Horace, *Lydia, dic per omnes.*

ANACRISIS, among the ancient Greeks, is ufed for a kind of trial or examination, which the archons, or chief magiftrates of Athens, were to undergo before their admiffion into that office. The *anacrifis* ftands diftinguifhed from the *docimafia*, which was a fecond examination, in the forum. The anacrifis was performed in the fenate-houfe. The queftion here propofed to them were concerning their family, kindred, behaviour, eftate, &c. Some will have it that all magiftrates underwent the anacrifis.

Anacrisis, among civilians, an inveftigation of truth, interrogation of witneffes, and inquiry made into any fact, efpecially by torture.

ANACROSIS, in antiquity, denotes a part of the Pythian fong, wherein the combat of Apollo and Python are defcribed.—The anacrofis was the firft part, and contained the preparation to the fight.

ANACYCLUS, in botany: a genus of the polygamia fuperflua order, belonging to the fyngenefia clafs of plants; and, in the natural method, ranking under the 49th order, *Compofitæ-difcoides*. The characters are: The *calyx* is hemifpheric and imbricated: The *corolla* is radiated: The *ftamina* confift of five very fhort capillary filaments; the anthera cylindric and tubular: The *piftillum* has an oval germen; a filiform ftylus; a bifid ftigma in the hermaphrodites, two flender reflected ftigmata in the females: There is no *pericarpium;* but the calyx unchanged: The *feeds* are folitary, with membranous wings; the *receptaculum* is chaffy.

ANADAVADÆA, in ornithology, a barbarous name of a fpecies of alauda. See Alauda.

ANADEMA, among the ancients, denotes an ornament of the head, wherewith victors at the facred games had their temples bound.

ANADIPLOSIS, in rhetoric and poetry, a repetition of the laft word of a line, or claufe of a fentence, in the beginning of the next: Thus,

> *Pierides, vos hæc facietis maxima Gallo:*
> *Gallo cujus amor*, &c.
> *Et matutinis accredula vocibus inftat,*
> *Vocibus inftat, & affiduas jacit ore querelas.*

ANADROMOUS, among ichthyologifts, a name given to fuch fifhes as go from the fea to the frefh waters at ftated feafons, and return back again; fuch as the falmon, &c. See Salmo.

ANADUOMENE Venus, in the Grecian mythology, anfwered to the Sea-Venus in the Roman, and was the appellation given to one of the chief deities of the

the sea. The most celebrated picture in all antiquity was that of this goddess by Apelles; and the famous Venus of Medici is a Sea-Venus.

ANÆDEIA, in antiquity, a denomination given to a silver stool placed in the Areopagus, on which the defendent, or person accused, was seated for examination. The word is Greek, Αναιδεια, which imports imprudence; but according to Junius's correction, it should rather be Αναιτια, q. d. *innocence.* The plaintiff, or accuser, was placed on an opposite stool called *hybris*, or injury; here he proposed three questions to the party accused, to which positive answers were to be given. The first, Are you guilty of this fact? The second, How did you commit the fact? The third, Who were your accomplices?

ANÆSTHESIA, signifies a privation of the senses.

ANAGALLIS, PIMPERNEL: A genus of the monogynia order, belonging to the pentandria class of plants; and, in the natural method, ranking under the 20th order, *Rotaceæ.* The characters are: The *calyx* is a quinquepartite perianthium, which is persistent: The *corolla* consists of one rotated petal: The *stamina* consist of five erect filaments shorter than the corolla; the antheræ are simple: The *pistillum* has a globular germen; the stylus slightly declinated, the stigma headed: The *pericarpium* is a globular capsule, unilocular and circumcised: The *seeds* are numerous and angled; the receptaculum globular and very large. Of this there are four

Species. 1. The arvensis, or common pimpernel, with a red flower. 2. The fæmina, with a blue flower. 3. The monelli, or narrow-leaved pimpernel. 4. The latifolia, or Spanish pimpernel.—The first sort is very common in corn-fields, and other cultivated places in Britain. The second is sometimes found wild in the fields, but is not so common as the first. The third is a beautiful small perennial plant, and produces numbers of fine blue flowers. The fourth is a native of Spain, and likewise produces blue flowers.

These plants are very easily propagated by seeds; and if suffered to remain till their seeds scatter, they become troublesome weeds.—The arvensis is not unfrequently taken as food; it makes no unpleasant salad, and in some parts of this kingdom is a common pot-herb. All the species are eat by cows and goats, but refused by sheep; small birds are greatly delighted with the seeds.—Great medicinal virtues were formerly expected from the first two species; but they are now justly disregarded.

ANAGNIA, (anc. geog.), a town of Latium, capital of the Hernici; which, after a faint resistance, submitting to the Romans, was admitted to the freedom of the city, yet without the right of suffrage, (Livy.) It was afterwards a colony of Drusus Cæsar, and walled round, and its territory assigned to the veterans, (Frontinus.) Here Antony married Cleopatra, and divorced Octavia. Now *Anagni*, 36 miles to the east of Rome. Long. 13. 45. Lat. 42. 48.

ANAGNOSTA, or ANAGNOSTES, in antiquity, a kind of literary servant, retained in the families of persons of distinction, whose chief business was to read to them during meals, or at any other time when they were at leisure. Cornelius Nepos relates of Atticus, that he had always an agnostes at his meals. He never supped without reading; so that the minds of his guests were no less agreeably entertained than their appetites. The same custom, Eginhard observes, was kept up by Charlemagne, who at table had the histories and acts of ancient kings read to him. This custom seems to have been a relic of that of the ancient Greeks, who had the praises of great men and heroes sung to them while at table. The ancient monks and clergy kept up the like usage, as we are informed by St Augustin.

ANAGOGICAL, signifies mysterious, transporting; and is used to express whatever elevates the mind, not only to the knowledge of divine things, but of divine things in the next life. This word is seldom used, but with regard to the different senses of Scripture. The anagogical sense is, when the sacred text is explained with a regard to eternal life, the point which Christians should have in view: for example, the rest of the sabbath, in the anagogical sense, signifies the repose of everlasting happiness.

ANAGOGY, or ANAGOGE, among ecclesiastical writers, the elevation of the mind to things celestial and eternal.—It is particularly used, where words, in their natural or primary meaning, denote something sensible, but have a further view to something spiritual or invisible.

ANAGOGY, in a more particular sense, denotes the application of the types and allegories of the Old Testament to subjects of the New; thus called, because the veil being here drawn, what before was hidden, is exposed to open sight.

ANAGRAM (from the Greek ανα *backwards*, and γραμμα *letter*), in matters of literature, a transposition of the letters of some name, whereby a new word is formed, either to the advantage or disadvantage of the person or thing to which the name belongs. Thus, the anagram of Galenus is *angelus;* that of Logica, *caligo;* that of Alstedius, *sedulitas;* that of Loraine is *alerion*, on which account it was that the family of Loraine took *alerions* for their armoury.—Calvin, in the title of his *Institutions*, printed at Strasburg in 1539, calls himself *Alcuinus*, which is the anagram of Calvinus, and the name of an eminently learned person in the time of Charlemagne, who contributed greatly to the restoration of learning in that age.

Those who adhere strictly to the definition of an anagram, take no other liberty than that of omitting or retaining the letter H, at pleasure; whereas others make no scruple to use E for Æ, V for W, S for Z, and C for K; and *vice versa.*

Besides anagrams formed as above, we meet with another kind in ancient writers, made by dividing a single word into several; thus, *sus tinea mus*, are formed out of the word *sustineamus.*

Anagrams are sometimes also made out of several words: such is that on the question put by Pilate to our Saviour, *Quid est veritas?* whereof we have this admirable anagram, viz. *Est vir qui adest.*

The Cabbalists among the Jews are professed anagrammatists; the third part of their art, which they call *themuru*, i. e. "changing," being nothing but the art of making anagrams, or of finding hidden and mystical meanings in names; which they do by changing, transposing, and differently combining, the letters of those names,

names.—Thus, of נח the letters of Noah's name, they make חן *grace;* of משיח *the Meſſiah,* they make ישמח *he ſhall rejoice.*

ANAGRAMMATIST, a maker or compoſer of anagrams. Thomas Billon, a provincial, was a celebrated anagrammatiſt, and retained by Lewis XIII. with a penſion of 1200 livres, in quality of anagrammatiſt to the king.

ANAGROS, in commerce, a meaſure for grain uſed in ſome cities of Spain, particularly at Seville; 46 anagros make about 10¼ quarters of London.

ANAGYRIS, STINKING BEAN-TREFOIL: A genus of the monogynia order, belonging to the decandria claſs of plants; and, in the natural method, ranking under the 32d order, *Papilionaceæ.* The characters are: The *calyx* is a bell-ſhaped perianthium: The *corolla* is papilionaceous; the vexillum cordated, ſtraight, emarginated, and twice as long as the calyx; the alæ ovate, and longer than the vexillum; the carina ſtraight and very long: The *ſtamina* conſiſt of 10 filaments; the antheræ ſimple: The *piſtillum* has an oblong germen, a ſimple ſtylus, and a villous ſtigma: The *pericarpium* is an oblong legumen: The *ſeeds* are ſix or more, and kidney-ſhaped.

Of this genus there is but one ſpecies, the fetida, which grows naturally in the ſouthern parts of Europe. It is a ſhrub which uſually riſes to the height of eight or ten feet, and produces its flowers in April or May. Theſe are of a bright yellow colour, growing in ſpikes, ſomewhat like the laburnum.

Culture. This plant may be propagated either by ſeeds, or by laying down the tender branches in the ſpring; but the firſt method is preferable. The ſeeds ſhould be ſown toward the end of March in pots filled with light earth, and plunged in a gentle hot-bed. The plants uſually appear in a month, when they ſhould be gradually inured to the open air, that they may be hardened before winter. In the autumn and winter, they muſt be ſheltered under a hot-bed frame: the ſpring following, they muſt be tranſplanted, each into a ſeparate ſmall pot, placed in a ſheltered ſituation, and again removed into a frame to ſhelter them during the following winter. The ſecond ſpring after the plants come up, ſome of them may be taken out of the pots, and planted in a border near a ſouth-wall, where, if they are protected in winter, they may remain.

ANAGYRIS, or ANAGYRUS, the name of a place in Attica, of the tribe Erechtheis, where a fetid plant, called *Anagyris,* probably the ſame with the foregoing, grew in great plenty, (Dioſcorides, Pliny, Stephanus;) and the more it was handled, the ſtronger it ſmelled: hence *commovere anagyrin* (or *anagyrum*), is to bring a misfortune on one's ſelf, (Ariſtophanes.)

ANAK, the father of the Anakims, was the ſon of Arba, who gave his name to Kirjath-arba, or Hebron, Joſh. xiv. 15. Anak had three ſons, Sheſhai, Ahiman, and Talmai, (chap. xv. 14. and Numb. xiii. 22.) who, as well as their father, were giants, and who with their poſterity, all terrible for their fierceneſs and extraordinary ſtature, were called the *Anakims;* in compariſon of whom the Hebrews, who were ſent to view the land of Canaan, reported that they were but as graſshoppers. Numb. xiii. *ult.* Caleb, aſſiſted by the tribe of Judah, took Kirjath-arba, and deſtroyed the Anakims, (Judges i. 20. and Joſh. xv. 14.) in the year of the world 2559.

ANALECTA, or ANALECTES, in antiquity, a ſervant whoſe employment it was to gather up the off-falls of tables.

ANALECTA, *Analects,* in a literary ſenſe, is uſed to denote a collection of ſmall pieces; as eſſays, remarks, &c.

ANALEMMA, in geometry, a projection of the ſphere on the plane of the meridian, orthographically made by ſtraight lines and ellipſes, the eye being ſuppoſed at an infinite diſtance, and in the eaſt or weſt points of the horizon.

ANALEMMA, denotes likewiſe an inſtrument of braſs or wood, upon which this kind of projection is drawn, with an horizon and curſor fitted to it, wherein the ſolſtitial colure, and all circles parallel to it, will be concentric circles; all circles oblique to the eye, will be ellipſes; and all circles whoſe planes paſs through the eye, will be right lines. The uſe of this inſtrument is to ſhow the common aſtronomical problems; which it will do, though not very exactly, unleſs it be very large.

ANALEPSIS, the augmentation or nutrition of an emaciated body.

ANALEPTICS, reſtorative or nouriſhing medicines.

ANALOGY, in philoſophy, a certain relation and agreement between two or more things, which in other reſpects are entirely different.

There is likewiſe an analogy between beings that have ſome comformity or reſemblance to one another; for example, between animals and plants; but the analogy is ſtill ſtronger between two different ſpecies of certain animals.

Analogy enters much into all our reaſoning, and ſerves to explain and illuſtrate. A great part of our philoſophy, indeed, has no other foundation than analogy.

It is natural to mankind to judge of things leſs known, by ſome ſimilitude, real or imaginary, between them and things more familiar or better known. And where the things compared have really a great ſimilitude in their nature, when there is reaſon to think that they are ſubject to the ſame laws, there may be a conſiderable degree of probability in concluſions drawn from analogy. Thus we may obſerve a very great ſimilitude between this earth which we inhabit, and the other planets, Saturn, Jupiter, Mars, Venus, and Mercury. They all revolve round the ſun, as the earth does, although at different diſtances, and in different periods. They borrow all their light from the ſun, as the earth does. Several of them are known to revolve round their axis like the earth, and, by that means, muſt have a like ſucceſſion of day and night. Some of them have moons, that ſerve to give them light in the abſence of the ſun, as our moon does to us. They are all, in their motions, ſubject to the ſame law of gravitation, as the earth is. From all this ſimilitude, it is not unreaſonable to think, that thoſe planets may, like our earth, be the habitation of various orders of living creatures. There is ſome probability in this concluſion from analogy.

But it ought to be obſerved, that, as this kind of reaſoning can afford only probable evidence at beſt; ſo unleſs

Analogy. unlefs great caution be ufed, we are apt to be led into error by it. To give an inftance of this: Anatomifts, in ancient ages, feldom diffected human bodies; but very often the bodies of thofe quadrupeds whofe internal ftructure was thought to approach neareft to that of the human body. Modern anatomifts have difcovered many miftakes the ancients were led into, by their conceiving a greater fimilitude between the ftructure of men and of fome beafts than there is in reality.

Reid on the Intellectual Powers, Effay I. ch. iv. p. 52.

Perhaps no author has made a more juft and a more happy ufe of this mode of reafoning, than bifhop Butler in his Analogy of Religion, Natural and Revealed, to the Conftitution and Courfe of Nature. In that excellent work, the author does not ground any of the truths of religion upon analogy, as their proper evidence. He only makes ufe of analogy to anfwer objections againft them. When objections are made againft the truths of religion, which may be made with equal ftrength againft what we know to be true in the courfe of nature, fuch objections can have no weight.

Analogical reafoning, therefore, may be of excellent ufe in anfwering objections againft truths which have other evidence. It may likewife give a greater or a lefs degree of probability in cafes where we can find no other evidence. But all arguments drawn from analogy are ftill the weaker, the greater difparity there is between the things compared; and therefore muft be weakeft of all when we compare body with mind, becaufe there are no two things in nature more unlike.

There is no fubject in which men have always been fo prone to form their notions by analogies of this kind, as in what relates to the mind. We form an early acquaintance with material things by means of our fenfes, and are bred up in a conftant familiarity with them. Hence we are apt to meafure all things by them; and to afcribe to things moft remote from matter the qualities that belong to material things. It is for this reafon that mankind have, in all ages, been fo prone to conceive the mind itfelf to be fome fubtile kind of matter: That they have been difpofed to afcribe human figure, and human organs, not only to angels, but even to the Deity.

To illuftrate more fully that analogical reafoning from a fuppofed fimilitude of mind to body, which appears to be the moft fruitful fource of error with regard to the operations of our minds, the following inftance may be given. When a man is urged by contrary motives, thofe on one hand inciting him to do fome action, thofe on the other to forbear it; he deliberates about it, and at laft refolves to do it, or not to do it. The contrary motives are here compared to the weights in the oppofite fcales of a balance; and there is not perhaps any inftance that can be named of a more ftriking analogy between body and mind. Hence the phrafes of weighing motives, of deliberating upon actions, are common to all languages.

From this analogy, fome philofophers draw very important conclufions. They fay, that, as the balance cannot incline to one fide more than the other, when the oppofite weights are equal; fo a man cannot poffibly determine himfelf if the motives on both hands are equal; and as the balance muft neceffarily turn to that fide which has moft weight, fo the man muft neceffarily be determined to that hand where the motive is ftrongeft. And on this foundation fome of the fchoolmen maintained, that if a hungry afs were placed between two bundles of hay equally inviting, the beaft muft ftand ftill and ftarve to death, being unable to turn to either, becaufe there are equal motives to both. This is an inftance of that analogical reafoning, which, it is conceived, ought never to be trufted; for the analogy between a balance and a man deliberating, though one of the ftrongeft that can be found between matter and mind, is too weak to fupport any argument. A piece of dead inactive matter, and an active intelligent being, are things very unlike; and becaufe the one would remain at reft in a certain cafe, it does not follow that the other would be inactive in a cafe fomewhat fimilar. The argument is no better than this, that, becaufe a dead animal moves only as it is pufhed, and, if pufhed with equal force in contrary directions, muft remain at reft; therefore the fame thing muft happen to a living animal; for furely the fimilitude between a dead animal and a living, is as great as that between a balance and a man.

Analogy.

The derivation of the word Analogy indicates, as profeffor Caftillon of Berlin * obferves, a refemblance difcernible by reafon. This is confirmed hy the fenfe in which the term is ufed in geometry, where it fignifies an equality of ratios.—In explaining this fubject, it is obferved, there may be a refemblance between fenfations and a refemblance between perceptions: the former is called *phyfical refemblance*, becaufe it acts upon the phyfical or fenfitive faculty; the latter *moral refemblance*, becaufe it affects the moral or rational faculty of man.

* *Haarlem Memoirs* for 1786, or vol. xxii.

Every refemblance may be reduced to an equality in fenfations or perceptions; but this fuppofes fome equality in their caufes: we fay *fome equality*, becaufe the difpofition of the organs, or of the foul, muft neceffarily affect the fenfations or perceptions; but this can influence only their degree, and not their nature.

The character of one perfon refembles that of another only when they both fpeak and act fo as to excite equal perceptions, or to fpeak more ftrictly, the fame perception; when they both difplay vivacity or indifference, anger or meeknefs, on the fame occafions, and both excite in the foul of the obferver identical perceptions, or rather the fame perception of vivacity or indifference, of anger or meeknefs. Thefe identical perceptions, the degree of which will depend much on the difpofition of the obferver's mind, muft have identical caufes, or, in other words, the fame caufe; which is the vivacity or indifference, the anger or meeknefs, difplayed by each of thefe characters.

Every phyfical refemblance may therefore be reduced to one or more equalities; and every moral refemblance to one or more identities. Wherever there is moral refemblance there is analogy. Analogy may therefore be reduced to identity, and always fuppofes comparifon.

Two objects are faid to have an analogy to each other, or are called *analogous*, when fome identity is difcovered upon comparing them. An *analogical conclufion*, is a conclufion deduced from fome identity.

The principles of analogy are a comparifon of two objects; and one or more identities refulting from their being thus compared. The characters of analogy are —that two objects be compared—that there be one or more identities between thefe objects—and that this is difcernible only by reafon or intellect.

 Phyfical

Phyfical refemblance is to the fenfes what *analogy* is to the underftanding.—The former, when perfect, becomes equality; but the latter, identity.

Refemblance and analogy are the foundations both of probability and of certainty. When we are not fatisfied that the refemblance or the analogy is complete, we ftop at probability; which becomes certainty when we are, or think we are, affured that the refemblance or the analogy is perfect.

In reafoning by analogy, we fhould be careful not to confound it with refemblance; and alfo not to deduce from the identity or identities, on which the analogy is founded, a conclufion, which has either no relation, or only a partial relation, to thefe identities.

The principal ufe of analogy in the inveftigation of phyfical and moral truth, according to our author, may be reduced to the four following: 1. By means of our fenfes to improve, firft our own judgment, and afterwards that of others, with refpect to intellectual fubjects. 2. To deduce a general from a particular truth. Having difcovered and proved the truth of a propofition with refpect to any particular object, examine whether this truth flows from a quality peculiar to this fingle object, or common to feveral objects. In the latter cafe all thefe objects may be comprehended under one general idea, founded on their common quality. Subftitute this general idea inftead of the particular object, and the propofition will become general, without ceafing to be true; becaufe whatever evidently and folely refults from the identity, on which an analogy is founded, muft neceffarily be true with refpect to all thofe objects in which the analogy is the fame. 3. To prove the truth or falfehood of propofitions which cannot be otherwife demonftrated. 4. To difcover new truths in both natural and moral philofophy.

Analogy, among grammarians, is the correfpondence which a word or phrafe bears to the genius and received forms of any language.

ANALYSIS, in a general fenfe, implies the refolution of fomething compounded into its original and conftituent parts. The word is Greek, and derived from αναλυω, to refolve.

Analysis, in mathematics, is properly the method of refolving problems by means of algebraical equations; whence we often find that thefe two words, *analyfis* and *algebra*, are ufed as fynonymous.

Analyfis, under its prefent improvements, muft be allowed the apex or height of all human learning: it is this method which furnifhes us with the moft perfect examples of the art of reafoning; gives the mind an uncommon readinefs at deducing and difcovering, from a few data, things unknown; and, by ufing figns for ideas, prefents things to the imagination, which otherwife feemed out of its fphere: by this, geometrical demonftrations may be greatly abridged, and a long feries of argumentations, wherein the mind cannot without the utmoft effort and attention difcover the connection of ideas, are hereby converted into fenfible figns, and the feveral operations required therein effected by the combination of thofe figns. But, what is more extraordinary, by means of this art, a number of truths are frequently expreffed by a fingle line, which in the common way of explaining and demonftrating things would fill whole volumes. Thus, by mere contemplation of one fingle line, whole fciences may be fometimes learnt in a few minutes time, which otherwife could fcarce be attained in many years.

Analysis is divided, with regard to its object, into that of *finites*, and *infinites*.

Analysis of Finite Quantities, is what we otherwife call fpecious arithmetic or algebra. See Algebra.

Analysis of Infinites, called alfo the *New Analyfis*, is particularly ufed for the method of fluxions, or the differential calculus. See Fluxions.

Analysis, in logic, fignifies the method of tracing things backward to their fource, and of refolving knowledge into its original principles. This is alfo called the method of *refolution;* and ftands oppofed to the fynthetic method, or that of *compofition.*—The art of logical analyfis confifts principally in combining our perceptions, claffing them together with addrefs, and contriving proper expreffions for conveying our thoughts, and reprefenting their feveral divifions, claffes, and relations.

Analysis, in rhetoric, is that which examines the connections, tropes, figures, and the like, inquiring into the propofition, divifion, paffions, arguments, and other apparatus of rhetoric.

Several authors, as Freigius and others, have given analyfes of Cicero's Orations, wherein they reduce them to their grammatical and logical principles; ftrip them of all the ornaments and additions of rhetoric which otherwife difguife their true form, and conceal the connection between one part and another. The defign of thefe authors is to have thofe admired harangues juft fuch as the judgment difpofed them, without the help of imagination; fo that here we may coolly view the force of each proof, and admire the ufe Cicero made of rhetorical figures to conceal the weak part of a caufe.

A collection has been made of the analyfes formed by the moft celebrated authors of the 16th century, in 3 vols. folio.

Analysis is alfo ufed, in chemiftry, for the decompounding of a mixed body, or the feparation of the principles and conftituent parts of a compounded fubftance.

To analyze bodies, or refolve them into their component parts, is indeed the chief object of the art of chemiftry. Chemiftry furnifhes feveral means for the decompofition of bodies, which are all founded on the differences of the properties belonging to the different principles of which the body to be analyzed is compofed. If, for example, a body be compofed of feveral principles, fome of which have a great, and others a moderate degree of volatility, and, laftly, others are fixed, its moft volatile parts may be firft feparated by a gradual heat in diftilling veffels; and then the parts which are next in volatility will pafs over in diftillation; and laftly, thofe parts which are fixed, and capable of refifting the action of fire, will remain at the bottom of the veffel.

Analysis is alfo ufed for a kind of fyllabus, or table of the principle heads or articles of a continued difcourfe, difpofed in their natural order and dependency. Analyfes are more fcientifical than alphabetical indexes; but they are lefs ufed, as being more intricate.

Analysis is likewife ufed for a brief, but methodical, illuftration of the principles of a fcience; in which fenfe

fenfe it is nearly fynonymous with what we otherwife call a *fynopfis*.

ANALYTIC, or ANALYTICAL, fomething that belongs to, or partakes of, the nature of analyfis.—Thus we fay, an analytical demonftration, analytical procefs, analytical table or fcheme, analytical method of inveftigation, &c.

The analytic method ftands oppofed to the fynthetic. In natural philofophy, as in mathematics, the inveftigation of difficult things by the analytic method ought to precede the method of compofition. This analyfis confifts in making experiments and obfervations, and in drawing general conclufions therefrom by induction; and admitting of no objections againft the conclufions, but fuch as are drawn from experiments, and other certain truths: and though the reafoning from experiments and obfervations by induction be no demonftration of general conclufions, yet it is the beft method of reafoning which the nature of things admits of; and may be efteemed fo much the ftronger, as the induction is more general; and, if no exception occur from phenomena, the conclufion may be pronounced general. By this way of analyfis, we may proceed from compounds to their ingredients; from motions to the forces producing them; and in general from effects to their caufes, and from particular caufes to more general ones, until we arrive at thofe which are the moft general. This is the analytic method, according to the illuftrious Newton.

The fynthetic method confifts in affuming the caufes difcovered and received as principles: and by them explaining the phenomena proceeding from them, and proving the explanations. See SYNTHESIS.

ANALYTICS, *Analytica*, the fcience and ufe of analyfis. The great advantage of the modern mathematics above the ancient is in point of analytics.

Pappus, in the preface to his feventh book of Mathematical Collections, enumerates the authors on the ancient analytics; being Euclid, in his *Data* and *Perifmata*; Apollonius, *de Sectione Rationis*, and in his *Conics*; Ariftæus, *de Locis Solidis*; and Eratofthenes, *de Mediis Proportionalibus*. But the ancient analytics were very different from the modern.

To the modern analytics principally belong algebra; an hiftorical account of which, with the feveral authors thereon, fee under the article ALGEBRA.

ANAMABOA, a populous town in the kingdom of Fantin, in Guinea. The natives are generally great cheats, and muft be carefully looked after in dealing with them, and their gold well examined, for it is commonly adulterated. It lies under the cannon of the Englifh caftle. The landing is pretty difficult on account of the rocks; and therefore thofe that come here to trade are forced to go afhore in canoes. The earth here is very proper to make bricks; the oyfters, when burnt, afford good lime; and there is timber in great abundance; fo that here are all the materials for building. The country at Anamaboa is full of hills, beginning at a good diftance from the town, and affording a very pleafant profpect. Indian corn and palm-wine are in great plenty. They have a green fruit called *papas*, as big as a fmall melon, and which has a tafte like cauliflower. Anamaboa is much frequented by the Englifh fhips and others for corn and flaves, which laft are fometimes to be had in great numbers. The Englifh fort is built on the foundation of a large old houfe, which fubfifted entire in 1679. It is a large edifice, flanked by two towers, and fortified towards the fea with two baftions: the whole of brick and ftone cemented with lime. It ftands upon a rock at the diftance of 30 paces from the fea. It is mounted with 12 pieces of cannon and 12 patereroes; and defended by a garrifon of 12 whites and 18 blacks, under the command of the chief factor.

The natives treat the garrifon of this fort with great infolence, infomuch as often to block them up, and frequently, if they diflike the governor, fend him off in a canoe to Cape Coaft with marks of the utmoft contempt. Far from being able to oppofe them, the Englifh are glad to obtain their favour with prefents. In 1701, they declared war againft the Englifh; and having affembled in a tumultuous manner before the fort, they fet fire to the exterior buildings, and went on with their outrages, till they were difperfed by a difcharge of the cannon from the batteries. The night following the Englifh took their revenge, by fetting fire to the town of Anamaboa; and thus hoftilities continued for 20 days, till at laft the natives were obliged to fue for peace. This fort was abandoned in 1733; but has been refumed by the Englifh, who have continued in it ever fince.

ANAMELECH, an idol of the Sepharvaites, who are faid in Scripture to have burned their children in honour of Adrammelech and Anamelech.—Thefe idols probably fignified the fun and moon. Some of the rabbins reprefent Anamelech under the figure of a mule, others under that of a quail or pheafant.

ANAMIM, the fecond fon of Mizraim (Gen. x. 13.). Anamim, if we may credit the paraphraft Jonathan the fon of Uzziel, peopled the Mareotis; or the Pentapolis of Cyrene, according to the paraphraft of Jerufalem. Bochart is of opinion that thefe Anamims were the people that dwelt in the parts adjacent to the temple of Jupiter Ammon, and in the Nafamonitis. Calmet thinks the Amanians and Garamantes to be defcended from Anamim.

ANAMORPHOSIS, in perfpective drawings, is a deformed or diftorted portrait or figure, generally confufed and unintelligible to the common unaffifted view; but when feen at a certain diftance and height, or as reflected from a plain or curved mirror, will appear regular and in right proportion. See OPTICS (the *Index*), and PERSPECTIVE.

ANANAS, in botany, the trivial name of a fpecies of bromelia. See BROMELIA.

ANANCITIS, in antiquity, a kind of figured ftone, otherwife called *fynochitis*, celebrated for its magical virtue of raifing the fhadows of the infernal gods.

ANANIAS, a Sadducee, high-prieft of the Jews, who put to death St James the brother of our Lord, and was depofed by Agrippa.

ANANISABTA, or ANANISAPTA, a magical word frequently found infcribed on coins and other amulets, fuppofed to have a virtue of preferving the wearer from the plague.

ANAPÆST, in ancient poetry, a foot confifting of two fhort fyllables and one long: Such is the word fcŏpŭlōs. It is juft the reverfe of the dactyl.

ANAPÆSTIC VERSES, thofe confifting wholly or chiefly of anapefts.

ANAPHE (anc. geog.), an iſland ſpontaneouſly emerging out of the Cretan ſea, near Thera (Pliny, Strabo); now called *Nanſio.* Its name is from the ſudden appearance of the new moon to the Argonauts in a ſtorm (Apollonius), *Anaphæus*, an epithet of Apollo, who was worſhipped there. *Anaphæi*, the people.

ANAPHORA, in rhetoric, the repetition of the ſame word or words in the beginning of a ſentence or verſe: Thus Virgil,

> *Pan etiam Arcadia mecum ſe judice certet,*
> *Pan etiam Arcadia dicat ſe judice victum.*

ANAPHORA, among phyſicians, the throwing off purulent matter by the mouth.

ANAPHRODISIA, ſignifies impotence, or want of power to procreate. See IMPOTENCE.

ANAPLASIS, ſignifies the replacing or ſetting a fractured bone.

ANAPLORETICS, medicines that promote the growth or granulation of the fleſh in wounds, ulcers, &c.

ANARCHI, Αναρχοι, in antiquity, a name given by the Athenians to four ſupernumerary days in their year, during which they had no magiſtrates. The Attic year was divided into ten parts, according to the number of tribes, to whom the precedency of the ſenate fell by turns. Each diviſion conſiſted of 35 days; what remained after the expiration of theſe, to make the lunar year complete, which according to their computation conſiſted of 354 days, were employed in the creation of magiſtrates, and called αναρχοι ημεραι, and αρχαιρεσιαι

ANARCHY, the want of government in a nation, where no ſupreme authority is lodged, either in the prince or other rulers; but the people live at large, and all things are in confuſion. The word is derived from the Greek privative α, and αρχη, *command, principality.* Anarchy is ſuppoſed to have reigned after the deluge, before the foundation of monarchies. We ſtill find it obtain in ſeveral parts, particularly of Africa and America.

ANARCHY is alſo applied to certain troubleſome and diſorderly periods, even in governments otherwiſe regular. In England, the period between the death of Cromwell and King Charles's reſtoration is commonly repreſented as an *anarchy.* Every month produced a new ſcheme or form of government. Enthuſiaſts talked of nothing but annulling all the laws, aboliſhing all writings, records, and regiſters, and bringing all men to the primitive level. No modern nation is more ſubject to anarchies than Poland; where every interval between the death of one king and the election of another is a perfect picture of confuſion, inſomuch that it is a proverb among that people, *Poland is governed by confuſion.* The Jewiſh hiſtory preſents numerous inſtances of anarchies in that ſtate, uſually denoted by this phraſe, that *in thoſe days there was no king in Iſrael, but every man did that which was right in his own eyes;* which is a juſt picture of an *anarchy.*

ANARRHICAS, in ichthyology, a genus of fiſhes of the order of apodes. There is but one ſpecies of this genus, viz. the anarrhicas lupus, or ſea-wolf; which ſeems to be confined to the northern parts of the globe. We find it in the ſeas of Greenland; in thoſe of Iceland and Norway; on the coaſts of Scotland and of Yorkſhire; and laſtly, in that part of the German ocean which waſhes the ſhores of Holland, the moſt ſouthern of its haunts that we can with any certainty mention.

It is a moſt ravenous and fierce fiſh, and, when taken, faſtens on any thing within its reach: the fiſhermen dreading its bite, endeavour as ſoon as poſſible to beat out its fore-teeth, and then kill it by ſtriking it behind the head. Schonevelde relates, that its bite is ſo hard, that it will ſeize on an anchor, and leave the marks of its teeth in it; and the Daniſh and German names of *ſteenbider* and *ſteinbeiſſer*, expreſs the ſenſe of its great ſtrength, as if it was capable of cruſhing even ſtones with its jaws.

It feeds almoſt entirely on cruſtaceous animals and ſhell-fiſh, ſuch as crabs, lobſters, prawns, muſcles, ſcollops, large whelks, &c. theſe it grinds to pieces with its teeth, and ſwallows with the leſſer ſhells. It does not appear they are diſſolved in the ſtomach, but are voided with the feces; for which purpoſe the aperture of the anus is wider than in other fiſh of the ſame ſize.

It is full of roe in February, March, and April, and ſpawns in May and June.

This fiſh has ſo diſagreeable and horrid an appearance, that nobody at Scarborough except the fiſhermen will eat it, and they prefer it to holibut. They always before dreſſing take off the head and ſkin.

The ſea-wolf grows to a large ſize: thoſe on the Yorkſhire coaſt are ſometimes found of the length of four feet; according to Dr Gronovius, they have been taken near Shetland ſeven feet long, and even more.

The head is a little flatted on the top; the noſe blunt; the noſtrils are very ſmall; the eyes ſmall, and placed near the end of the noſe.

The teeth are very remarkable, and finely adapted to its way of life. The fore-teeth are ſtrong, conical, diverging a little from each other, ſtand far out of the jaws, and are commonly ſix above and the ſame below, though ſometimes there are only five in each jaw: theſe are ſupported within-ſide by a row of leſſer teeth, which makes the number in the upper jaw 17 or 18, in the lower 11 or 12. The ſides of the under jaw are convex inwards, which greatly adds to their ſtrength, and at the ſame time allows room for the large muſcles with which the head of this fiſh is furniſhed. The *dentes molares*, or grinding teeth of the under jaw, are higher on the outer than the inner edges, which inclines their ſurfaces inward: they join to the canine teeth in that jaw, but in the upper are ſeparate from them. In the centre are two rows of flat ſtrong teeth, fixed on an oblong baſis upon the bones of the palate and noſe.

The teeth of the anarrhicas are often found foſſil; and in that ſtate called *bufonites*, or *toad-ſtones:* theſe were formerly much eſteemed for their imaginary virtues, and were ſet in gold, and worn as rings.

The two bones that form the under jaw are united before by a looſe cartilage; which mechaniſm admitting of a motion from ſide to ſide, moſt evidently contributes to the deſign of the whole, viz. a facility of breaking, grinding, and comminuting, its teſtaceous and cruſtaceous food. At the entrance of the gullet, above and below, are two echinated bones: theſe are

very fmall, being the lefs neceffary, as the food is in a great meafure comminuted in the mouth by aid of the grinders.

The body is long, and a little compreffed fidewife; the fkin fmooth and flippery: it wants the lateral line. The pectoral fins confift of 18 rays. The dorfal fin extends from the hind-part of the head almoft to the tail; the rays in the frefh fifh are not vifible. The anal fin extends as far as the dorfal fin. The tail is round at its end, and confifts of 13 rays. The fides, back, and fins, are of a livid lead colour; the two firft marked downwards with irregular obfcure dufky lines: thefe in different fifh have different appearances. The young are of a greenifh caft, refembling the fea-wrack, amongft which they refide for fome time after their birth.

ANARROPIA, among phyficians, a tendency of the humours to the head or fuperior parts.

ANAS (anc. geog.), a river of Spain, rifing in the territory of Laminium of the Hither Spain, and now fpreading into lakes, again reftraining its waters, or, burrowing itfelf entirely in the earth, is pleafed often to reappear; it pours into the Atlantic (Pliny); now *Guadiana*, rifing in the fouth-eaft of New Caftile, in a diftrict commonly called Campo de Montiel, not far from the mountain Confuegra, from the lakes called *las Lagunas de Guadiana*, and then it is called *Rio Roydera*; and, after a courfe of fix leagues, burying itfelf in the earth for a league, it then rifes up again from three lakes, called *los Ojos de Guadiana*, near the village Villa Harta, five leagues to the north of Calatrava, and directs its courfe weftward through New Caftile, by Medelin, Merida, and Badajox, where it begins to bend its courfe fouthwards, between Portugal and Andalufia, falling into the bay of Cadiz near Ayamonte.

Anas, in ornithology, a genus of birds belonging to the order of anferes. The beak of this genus is a little obtufe, covered with an epidermis or fkin, gibbous at the bafe and broad at the apex: the tongue is obtufe and flefhy; the feet are webbed and fitted for fwimming. The fpecies are,

1. The cygnus, *ferus & manfuetus*.

α. The *ferus*, with a femicylindrical black bill, yellow wax, and a white body, is the whiftling or wild fwan of Englifh authors, and is lefs than the tame or mute fpecies, being about five feet in length. Thefe birds inhabit the northern world as high as Iceland, and as low as the foft climate of Greece or of Lydia, the modern Anatolia, in Afia Minor: it even defcends as low as Egypt. They fwarm, during fummer, in the great lakes and marfhes of the Tartarian and Siberian defarts; and refort in great numbers to winter about the Cafpian and Euxine feas. Thofe of the eaftern parts of Siberia retire beyond Kamtfchatka, either to the coafts of America, or to the ifles north of Japan. In Siberia they fpread far north, but not to the Arctic circle. They arrive in Hudfon's Bay about the end of May, where they breed in great numbers on the fhores, in the iflands, and in the inland lakes; but all retire to the fouthern parts of North America in autumn, even as low as Carolina and Louifiana. In Carolina they are faid to be of two forts; the larger, called from its note the *Trumpeter*, arrive in great flocks to the frefh rivers in winter, and in February retire to the great lakes to breed: the leffer are called *Hoopers*, and frequent moftly the falt water. The Indians of Louifiana wear the fkins, with the down attached to them, fewed together by way of covering; and of the larger feathers they make diadems for their chiefs, as well as weave the fmaller on threads, as barbers do for their wigs, with which they cover garments, which are worn only by women of the higheft rank. In Auguft thefe birds lofe their feathers, and are not able to fly; when the natives of Iceland and Kamtfchatka hunt them with dogs, which catch them by the neck, and eafily fecure their prey. In the laft place they are alfo killed with clubs. The eggs are accounted good food; and the flefh, efpecially that of the young, is much efteemed by the inhabitants. The ufes of the feathers are manifeft to every one; and the fkins of the body are worn by the inhabitants; befides which, that of the legs, taken off whole, is ufed for purfes, and appears not unlike fhagreen. Wild fwans, Linnæus fays, frequently vifit Sweden after a thaw, and are caught with apples in which a hook is concealed. The wild fwan frequents our coafts in hard winters in large flocks, but does not breed in Great Britain. Martin * acquaints us, that fwans come in October in great numbers to Lingey, one of the Weftern Ifles; and continue there till March, when they return northward to breed. A few continue in Mainland, one of the Orkneys, and breed in the little ifles of the frefh-water lochs; but the multitude retires at the approach of fpring. On that account, fwans are there the country-man's almanack: on their quitting the ifle, they prefage good weather; on their arrival, they announce bad. Thefe, as well as moft other water-fowl, prefer, for the purpofe of incubation, thofe places that are leaft frequented by mankind: accordingly we find that the lakes and forefts of the diftant Lapland are filled during fummer with myriads of waterfowl; and there fwans, geefe, the duck-tribe, goofanders, divers, &c. pafs that feafon; but in autumn return to us, and to other more hofpitable fhores.

* *Defcript. Weft. Ifles*, 71.

This fpecies has feveral diftinctions from the fpecies which we in Britain call the *tame fwan*. In Ruffia this fpecies more fitly claims the name, it being the kind moft commonly tamed in that empire. The whiftling fwan carries its neck quite erect, the other fwims with it arched. This is far inferior in fize. This has twelve ribs on a fide, the mute only eleven. But the moft remarkable is the ftrange figure of the windpipe; which falls into the cheft, then turns back like a trumpet, and afterwards makes a fecond bend to join the lungs. Thus it is enabled to utter a loud and fhrill note. The other fwan, on the contrary, is the moft filent of birds: it can do nothing more than hifs, which it does on receiving any provocation. The vocal kind emits its loud notes only when flying or calling. Its found is, *whoogh, whoogh*, very loud and fhrill, but not difagreeable, when heard far above one's head and modulated by the winds. The natives of Iceland compare it to the notes of a violin. In fact, they hear it (fays Mr Pennant) at the end of their long and gloomy winter, when the return of the fwans announces the return of fummer; every note muft be therefore melodious which prefages the fpeedy thaw, and the releafe from their tedious confinement.

It is from this fpecies alone that the ancients have given the fable of the fwan being endued with the powers

powers of melody. Embracing the Pythagorean doctrine, they made the body of this bird the manſion of the ſouls of departed poets; and after that, attributed to the birds the ſame faculty of harmony which their inmates poſſeſſed in a pre-exiſtent ſtate. The vulgar, not diſtinguiſhing between ſweetneſs of numbers and melody of voice, thought that real which was only intended figuratively. The mute ſwan, Mr Pennant obſerves, never frequents the Padus, nor is ever ſeen on the Cayſter in Lydia; each of them ſtreams celebrated by the poets for the great reſort of ſwans.

In time, a ſwan became a common trop for a *bard.* Horace calls Pindar *Dircæum Cygnum;* and in one ode even ſuppoſes himſelf changed into a ſwan. Virgil ſpeaks of his poetical brethren in the ſame manner:

> *Vare*, tuum nomen
> Cantantes ſublime ferent ad ſidera cygni. *Eclog.* ix.

When he ſpeaks of them figuratively, he aſcribes to them melody, or the power of muſic; but when he talks of them as birds, he lays aſide fiction, and, like a true naturaliſt, gives them their real note:

> Dant ſonitum *rauci* per ſtagna loquacia cygni.
> *Æneid.* Lib. x. 50.

It was alſo a popular opinion among the ancients, that the ſwan foretold its own end. To explain this, we muſt conſider the twofold character of the poet, *vates* and *poeta*, which the fable of the tranſmigration continues to the bird; or they might be ſuppoſed to derive that faculty from Apollo their patron deity, the god of prophecy and divination.

As to their being ſuppoſed to ſing more ſweetly at the approach of death, the cauſe is beautifully explained by Plato, who attributes that unuſual melody to the ſame ſort of ecſtaſy that good men are ſometimes ſaid to enjoy at that awful hour, foreſeeing the joys that are preparing for them on putting off mortality.

β, The *manſuetus*, or mute ſwan, is the largeſt of the Britiſh Birds. It is diſtinguiſhed externally from the wild ſwan; firſt, by its ſize, being much larger; ſecondly, by its bill, which in this is red, and the tip and ſides black, and the ſkin between the eyes and bill is of the ſame colour. Over the baſe of the upper mandible, projects a black callous knob: the whole plumage, in old birds, is white; in young ones, aſh-coloured till the ſecond year: the legs are duſky; but Dr Plott mentions a variety found on the Trent near Rugely, with red legs.

The ſwan is found wild in Ruſſia and Siberia, moſt plentiful in the laſt. It arrives later from the ſouth, and does not ſpread ſo far north. Thoſe about the ſouthern part of the Caſpian Sea are very large, and much eſteemed for the uſe of the table. The ſwan is held in high veneration by the Mahometans. It is a very ſtrong bird, and ſometimes exceeding fierce: has not unfrequently been known to throw down and trample under feet youths of fifteen or ſixteen years of age, and an old one to break the leg of a man with a ſtroke of the wings. It is ſaid to be very long-lived, and frequently to arrive at the hundredth year. The young are not perfect in plumage till the ſecond year. The ſwan lays the firſt egg in February, and continues laying every other day to the amount of ſix, ſeven, or eight eggs; theſe it places on a bed of graſs near the water, and ſits ſix weeks. It feeds on both fiſh and herbage.

No bird, perhaps, makes ſo inelegant a figure out of the water, or has the command of ſuch beautiful attitudes on that element, as the ſwan: almoſt every poet has taken notice of it; but none with that juſtneſs of deſcription, and in ſo picturesque a manner, as our Milton:

> The ſwan, with arched neck
> Between her white wings mantling, proudly rows
> Her ſtate with oary feet. *Par. Loſt*, B. vii.

In former times, it was ſerved up at every great feaſt, when the elegance of the table was meaſured by the ſize and quantity of the good cheer. Cygnets are to this day fattened at Norwich about Chriſtmas, and are ſold for a guinea a-piece.

Swans were formerly held in ſuch great eſteem in England, that by an act of Edward IV. c. 6. "no one that poſſeſſed a freehold of leſs clear yearly value than five marks, was permitted to keep any, *other than the ſon of our ſovereign lord the king.*" And by the eleventh of Henry VII. c. 17. the puniſhment for taking their eggs was impriſonment for a year and a day, and a fine at the king's will. Though at preſent they are not ſo highly valued as a delicacy, yet great numbers are preſerved for their beauty; we ſee multitudes on the Thames and Trent, but no where greater numbers than on the ſalt-water inlet of the ſea near Abbotſbury in Dorſetſhire.

2. The cygnoides, with a ſemicylindrical bill, gibbous wax, and tumid eye-brows. It is the ſwan-gooſe of Ray, from Guinea. There is likewiſe a variety of this ſpecies, of a leſs ſize, called the *gooſe of Muſcovy.* They are found wild about the Lake Baikal in the eaſt of Siberia, and in Kamtſchatka. They are alſo kept tame in moſt parts of the Ruſſian empire. Theſe birds likewiſe inhabit China, and are common at the Cape of Good Hope. This is no doubt the ſpecies mentioned by Kolben called *crop-gooſe;* who ſays, that the ſailors make tobacco-pouches and purſes of the membrane which hangs beneath the throat, as it is ſufficiently tough for ſuch purpoſes, and will hold two pounds of tobacco.

They are ſufficiently common in Britain, and readily mix with the common gooſe; the breeds uniting as freely, and continuing to produce as certainly, as if no ſuch mixture had taken place. They are much more noiſy than the common tame geeſe, taking alarm at the leaſt noiſe; and even without diſturbance will emit their harſh and diſagreeable ſcream the whole day through. They walk very erect, with the neck much elevated; and as they bear a middle line between that of the ſwan and gooſe, they have not improperly been called *ſwan-gooſe.*

3. The tadorna, or ſheildrake, has a flat bill, a compreſſed forehead, a greeniſh black head, and the body is variegated with white. This ſpecies is found as far as Iceland to the north. It viſits Sweden and the Orknies in the winter, and returns in ſpring. It is found in Aſia about the Caſpian Sea, and all the ſalt lakes of the Tartarian and Siberian deſarts, as well as in Kamtſchatka. Our voyagers, if right in the ſpecies, have alſo met with it at Falkland Iſles and Van Diemen's Land. It breeds in deſerted rabbit holes, or occupies them

Anas.

them in the absence of the owners; who, rather than make an attempt at dislodging the intruders, form others; though, in defect of ready-made quarters, these birds will frequently dig holes for themselves. They lay fifteen or sixteen roundish white eggs. These are placed at the further end of the hole, covered with down supplied from the breast of the female, who sits about 30 days. She is very careful of the young, and will often carry them from place to place in her bill: "this we are certain of (says Mr Latham), from a young one having been dropt at the foot of an intelligent friend unhurt, by the mother flying over his head." When a person attempts to take their young, the old birds show great address in diverting his attention from the brood: they will fly along the ground as if wounded, till the former are got into a place of security, and then return and collect them together. From this instinctive cunning, Turner, with good reason, imagines them to be the *chenalopex*, or *fox-goose*, of the ancients. The natives of the Orkneys to this day call them the *sly-goose*, from an attribute of that quadruped.

The young, as soon as hatched, take to the water, and swim surprisingly well; but do not come to their full plumage till the second year. This species, Mr Latham informs us, may be hatched under a tame duck, and the youg readily brought up; but are apt, after a few years, to attempt the mastery over the rest of the poultry. In a state of nature, the food seems chiefly to be small fish, marine insects, and shells; herbage has likewise been found in their stomachs. In a tame state will eat bread, grain, and greens. Their great beauty would tempt us to endeavour at domesticating the race; but it will not thrive completely, except in the neighbourhood of salt water, which somehow seems essential to its well-being. The flesh likewise is rank and unsavoury, though the eggs have at all times been thought very good.

4. The spectabilis, has a compressed bill gibbous at the base, a black feathery carina, and a hoary head. It is the grey-headed duck of Edwards, and the king-duck of Pennant. This beautiful species is found at Hudson's Bay, at Churchill River, and (though scarce) at York Fort; in winter it is met with as far South as New York. It is pretty frequent in the north of Siberia and Kamtschatka; it is found also on the coast of Norway, and has been killed in the Orkneys. It is common in Greenland; where the flesh is accounted excellent, and the crude gibbous part of the bill a great delicacy. It produces a down equally valuable as the eider. The skins are sewed together, and make warm garments. The natives kill them with darts, and use the following method to succeed:—A number of men in canoes falling in with a flock while swimming, on a sudden set up a shouting, making as much noise as they can; on which, the birds being too much frightened to fly away, dive under the water: but as the place at which they are to rise again is known by the bubbling of the water above, the hunters follow them up as close as may be; and after acting this three or four times over, the birds become so fatigued as to be easily killed.—This species builds on the sides of ponds and rivers; making its nest of sticks and moss, and lining it with feathers from the breast. It lays four or five whitish eggs, as large as those of the goose. The young fly in July. The food consists chiefly of worms and grass.

5. The fusca, or velvet duck, is of a blackish colour, has a white spot behind the eyes, and a white line on the wings. The male of this species is distinguished by a gibbosity at the base of the bill. It is the black duck of Ray, and is in length about 20 inches. This species frequents Hudson's Bay in summer, where it breeds. The nest is composed of grass; in which it lays from four to six white eggs, and hatches in July. It feeds on grass, and is known by the name of *cus cusi qua tum*. It retires south in winter; when it is frequently seen as far south as New York. Our late navigators met with it at Aoonalashka. It is now and then seen on the coasts of England, but is not common. It is more frequent on the continent, inhabiting Denmark and Russia. In some parts of Siberia it is very common; and it enters the list of those found at Kamtschatka. In breeding-time, it goes far inland to lay the eggs; which are eight or ten in number, and white. After the season is over, the males are said to depart; the females staying behind till the young are able to fly, when the two last go likewise off, but to what part is not certain. It is in greater plenty at Oehotska, especially about the equinox. Fifty or more of the natives go in boats and surround the whole flock, driving them in the flood up the river Ochotska; and, as soon as it ebbs, the whole company fall on them at once with clubs, and often knock so many of them on the head that each man has 20 or 30 for his share.

6. The nigra, or scoter, is totally black, and has a gibbosity at the base of the bill; the tail resembles a wedge; the female is brownish. It is the lesser black diver of Ray, and measures in length 22 inches. These birds are found on the northern coasts of England and those of Scotland in the winter season; but no where so common as on the French coasts, where they are seen in prodigious numbers from November to March, especially if the wind be to the north or north-west. Their chief food is a glossy bivalve shell, near an inch long, called by the French *vaimeaux*. These they are perpetually diving after, frequently to the depth of some fathoms; and an usual method of catching them is by placing nets under the water in such places as the shells are most numerous; by which means 30 or 40 dozen of them have been taken in one tide. The day seems to be spent by these birds between diving and flying to small distances over the water, which it does so low as frequently to dip the legs therein. It swallows the food whole, and soon digests the shells, which are found quite crumbled to powder among the excrements. It has been kept tame for some time, and will feed on soaked bread. The flesh tastes fishy to an extreme; on which account it is allowed by the Roman Catholics to be eaten on fast-days and in lent; and indeed must be a sufficient mortification.—These birds abound in all the northern parts of the continent, Lapland, Sweden, Norway, and Russia; and are found in great plenty on the great lakes and rivers of the north and east of Siberia, as well as on the sea-shores. It likewise inhabits North America; being met with at New York; and in all probability much more to the north on that continent and that of Asia, Osbeck having met with them in 30 and 34 degrees south latitude,

jured, infomuch as at laft to hinder it from walking. The flefh is much efteemed, and the birds are often feen in the markets at the proper feafon. This fpecies is found in America; in winter, as low as New York; in fummer, at Hudfon's Bay, where it frequents the frefh-water lakes, and makes in hollow trees a round neft of grafs lined with feathers from its breaft; lays from feven to ten white eggs.

23. The merfa, or Ural duck of Pallas, is fomewhat bigger than the common teal. The bill is large, broad, very tumid above the noftrils, and bifid in the adult bird, the end marked with diverging ftriæ; colour blue: the head, and part of the neck, are white; on the crown is a large patch of black: the middle of the neck is black: the fore-parts of the body are a yellowifh brown, undulated with black: the back is clouded with a cinereous and pale yellow, powdered with brown: the wings are fmall; the tail longifh, wedge-fhaped, and black: the legs are brown, on the forepart bluifh, and placed far back as in the diver genus. This fpecies is not unfrequent in the greater lakes of the Ural mountains, and the rivers Ob and Irtifch. It is not feen on the ground, for from the fituation of its legs it is unable to walk: but it fwims very well and quick; at which time the tail is immerfed in the water as far as the rump, ferving by way of rudder, contrary to the common method of a duck's fwimming. The neft is formed of reeds, and floats, fomething like to that of the grebe.

24. The American wigeon (*le canard jenfen* of Buffon), is rather bigger than our wigeon. The bill is of a lead-colour: the crown and forehead of a yellowifh white: the hind-part of the head and neck is black and white, fpeckled; and behind the eye is a black mark, changing in fome lights to green: the back and fcapulars are of a pale ruft-colour, waved with tranfverfe black lines: in the middle of the wing coverts there is a large bed of white: the quills and tail are deep brown: the legs dufky. It inhabits North America, from Carolina to Hudfon's Bay; but is no where a common bird. It is called at New-York, the *Pheafant Duck*. It is more plenty at St Domingo and Cayenne, where it is called *vingeon* or *gingeon*. At Martinico great flocks of them often take fhort flights from one rice plantation to another, where they make much havoc, particularly during the rainy feafon. They are faid to perch on trees. They feed in company; and have a centinel on the watch, like fome other birds. They are feldom feen during the day, lying hid in places fhaded from the fun: but fo foon as that luminary difappears, they come forth from their hiding-places to feed; and, during this, make a particular kind of noife, by which the fportfman is directed in his fearch after them: at other times their note is a kind of foft whiftle, which is often imitated in order to decoy them within reach of the gun. They fit in January; and in March the young are feen running about. They lay many eggs. Sometimes thefe are hatched under hens; in which cafe they are, while young, familiar, though when grown up exceedingly quarrelfome with other ducks: their flefh is moft excellent, efpecially fuch as are brought up tame. They appear upon the coafts of Hudfon's Bay in May, as foon as the thaws come on, chiefly in pairs: they lay there only from fix to eight eggs; and feed on flies and worms in the fwamps. They depart in flocks in autumn. They are known by the name of *atheikimo afheep*.

25. The acuta, pin-tail, or fea-pheafant of Ray, has a long acuminated tail, black below, with a white line on each fide of the back part of the head. It is a native of Europe. Mr Hartlib, in the appendix to his *Legacy*, tells us, that thefe birds are found in great abundance in Connaught in Ireland, in the month of February only; and that they are much efteemed for their delicacy.

26. The glacialis, or long-tailed duck, is inferior in fize to the former. The bill is fhort, black at the tip and bafe, orange-coloured in the middle; the cheeks are of a pale brown; the hind part of the head, and the neck both before and behind, are white; the breaft and back are of a deep chocolate colour; the four middle feathers of the tail are black, and two of them near four inches longer than the others, which are white: the legs dufky. Thefe birds breed in the moft northern parts of the world; and only vifit our coafts in the fevereft winters. It breeds in Hudfon's Bay and Greenland, among the ftones and grafs, making its neft, like the eider, with the down of its own breaft, which is equal in value to that of the eider, if it could be got in equal quantity; but the fpecies is fcarcer. It lays five eggs; fwims and dives admirably; and feeds on fhell-fifh, which it gets in very deep water. It flies irregularly, fometimes fhowing its back, fometimes its belly. It continues in Greenland the whole year, in unfrozen places: but there are feafons fo very fevere, as at times to force them towards the fouth. Thofe which breed between Lapland and the polar circle, are often driven into Sweden, and the neighbourhood of Peterfburgh: thofe from the coaft of the Icy fea, as low as lat. 55; but on the fetting in of froft, they retire ftill further fouth, unlefs where fome open fpots remain in the rivers. They vifit the frefh-water lakes in the Orkneys, in October, and continue there till April. At fun-fet they are feen, in great flocks, returning to and from the bays, where they frequently pafs the night, and make fuch a noife as to be heard fome miles in frofty weather.

27. The ferina, pochard, or red-headed widgeon of Ray, has a lead-coloured bill: the head and neck are of a bright gay colour: the breaft and part of the back where it joins the neck, are black: the coverts of the wings, the fcapulars, back, and fides under the wings, are of a pale grey, elegantly marked with narrow lines of black: the tail confifts of twelve fhort feathers, of a deep grey colour: the legs are lead coloured; and the irides of a bright yellow, tinged with red. The head of the female is of a pale reddifh brown. With us, thefe birds frequent the fens in the winter feafon, and are brought up to the London markets fometimes in confiderable numbers, where they are known by the name of *Dun Birds*, and are efteemed excellent eating. In winter, they pafs pretty far to the fouth, being found in Egypt, about Cairo. They come into France the end of October in fmall flocks, from 20 to 40; and are found in Carolina in winter. They feed on fmall fifh and fhells. Their flight is rapid and ftrong; but the flocks form no particular fhape in flying.

28. The querquedula, garganey, or firft teal of Aldrovandus, has a green fpot on the wings, and a white line

line above the eyes. It frequents the fresh waters of Europe. In many places it is called the *summer-teal.*

29. The creca, or common teal, has a green spot on the wings, and a white line both above and below the eyes. It is of a small size, only 14 inches in length. The teal is frequent in the London markets along with the wild-duck. It is met with in Duddingston-loch, a fresh-water lake, within a mile of Edinburgh. In France it stays throughout the year, and makes a nest in April among the rushes, on the edges of ponds; it is composed of the tenderest stalks of them, with the addition of the pith, and a quantity of feathers. The nest is of a large size, and placed in the water, so as to rise and fall with it. The eggs are the size of those of a pigeon, of a dirty white, marked with small hazel spots. It is said to feed on the grass and weeds which grow on the edges of the ponds which it frequents, as well as the seeds of the rushes; it will also eat small fish. The flesh is accounted excellent. It is found to the north as high as Iceland; and is mentioned as inhabiting the Caspian sea to the south.

30. The histrionica, or dusky-spotted duck of Edwards, is of a brown colour, variegated with white and blue; it has a double line on the ears and temples; the collar is white, and there is a white streak on the neck. It inhabits from Carolina to Greenland: in the last it frequents, during summer, the rapid rivers, and the most shady parts; nestling on the banks, among the low shrubs. It swims and dives admirably. In winter it seeks the open sea, flies high and swiftly, and is very clamorous. It feeds on shell-fish, spawn, and the larvæ of gnats. Is found in Iceland, and as low as Sondmor. It is common from the lake Baikal to Kamtschatka; and breeds there, as well as every where else, about the most rocky and rapid torrents.

31. The minuta, or little white and brown duck of Edwards, is of a greyish colour, with white ears, and the prime feathers of the wings blackish. This and the former, according to Latham, are found both on the old and new continents. On the first, it is seen as far south as the lake Baikal, and from thence to Kamtschatka, particularly up the river Ochotska; also in Iceland, and as low as Sondmor. In America, it is found from Carolina to Newfoundland, and Hudson's Bay; also in Greenland, where it frequents, during summer, bays and rivers, especially near their mouths, and is a very noisy species. It is fond of shady places, and makes the nest on the shore among the shrubs. Its food is small shells, eggs of fishes, and particularly the larvæ of gnats. It swims well, even in the most rapid streams; and dives to admiration: it likewise flies swift, and to a great height: from which circumstances, it is not easily taken. Our late navigators met with it at Aoonalashka. It is pretty frequent in the small rivulets of Hudson's Bay, about 90 miles inland; seldom in large rivers. It lays 10 or more white eggs, like those of the pigeon, on the grass; and the young brood speckled in a very pretty manner. It migrates south in autumn.

32. The boschas, common wild-duck of Ray, or mallard; the intermediate tail-feathers of the drake are turned backward, and the bill is strait. It frequents the lakes of different countries, and feeds upon frogs and several sorts of insects.—The wild-ducks pair in the spring; build their nests among rushes near the water, and lay from 10 to 16 eggs. The female is a very artful bird; and does not always make the nest close to the water, but frequently at a good distance from it; in which case the duck will take the young in its beak or between the legs. It is known sometimes to lay the eggs in a high tree, in a deserted magpie's or crow's nest. At moulting-time, when they cannot fly, they are caught in great numbers. They abound particularly in Lincolnshire, the great magazine of wild-fowl in this kingdom; where prodigious numbers are taken annually in the Decoys. Birds with flat bills, that find their food by groping, have three pair of nerves that extend to the end of their bills: these nerves are remarkably conspicuous in the head and bill of the wild-duck, and are larger than those of a goose or any other bird yet known: this is the reason they grope for food more than any other bird whatever.—The common tame species of ducks take their origin from these, and may be traced to it by unerring characters. The drakes, howsoever they vary in colours, always retain the curled feathers of the tail, and both sexes the form of the bill, of the wild kind. Nature sports in the colours of all domestic animals; and for a wise and useful end, That mankind may the more readily distinguish and claim their respective property.

In France this species is not often seen, except in winter; appearing in October, and going north in spring. They are caught in various manners; among the rest, in decoys, as in England; the chief place for which is Picardy, where prodigious numbers are taken, particularly on the river Somme. It is also customary there to wait for the flocks passing over certain known places, and the sportsman, having a wicker cage, containing a quantity of tame birds, lets out one at a time, at a convenient season, which enticing the passengers within gunshot, five or six are often killed at once by an expert marksman. They are now and then taken also by a hook baited with a bit of sheep's lights, which swimming on the water, the bird swallows the bait, and with it the hook. Various other means of catching ducks and geese are peculiar to certain nations; of which one seems worth mentioning from its singularity:—The person wishing to take these, wades into the water up to the chin, and having his head covered with an empty calabash, approaches the place where the ducks are; when they, not regarding an object of this sort, suffer the man freely to mix with the flock; after which he has only to pull them by the leg under the water, one after another, till he is satisfied; returning as unsuspected by the remainder as when he first came among them. This method is frequently put in practice on the river Ganges, using the earthen vessels of the Gentoos instead of the calabashes: these vessels are what the Gentoos boil their rice in, and are called Kutcharee pots (they likewise make a dish for their tables in them, which goes by the same name): after these are once used they look upon them as defiled, and in course throw them into the river as useless; and the duck-takers find them convenient for their purpose, as the ducks, from constantly seeing the vessels float down the stream, look upon them as objects of full as little regard as a calabash. The above, or some such method, is also practised in China as well as in India. The Chinese, however, though they make great use of ducks,

zyn, between the ſixth and tenth of April. They reſt a little time on the banks of the Sarpa, but ſoon reſume their arctic courſe. Their winter retreat is probably in Perſia. They are highly eſteemed for the table, being quite free from any fiſhy taſte.

14. The caſarca, or ruddy gooſe, is larger than a mallard, and ſeems even larger than it really is, from the length of wing, and ſtanding high on its legs. The bill is black: the irides are yellowiſh brown: forehead, cheeks, and throat, yellowiſh; fore part of the neck ferruginous, encircled with a collar of black, inclining to deep rufous on the throat: the breaſt and ſides are pale rufous; the belly is obſcure: the back is pale; the lower part is undulated, hoary, and brown, not very diſtinct; the rump and tail are greeniſh black: the legs long and black. This ſpecies is found in all the ſouthern parts of Ruſſia and Siberia in plenty. In winter it migrates into India, and returns northward in ſpring. It makes the neſt in the craggy banks of the Wolga and other rivers, or in the hollows of the deſerted hillocks of marmots; making it after the manner of the ſheldrake, and is ſaid to form burrows for itſelf in the manner of that bird. It has been known alſo to lay in an hollow tree, lining the neſt with its own feathers. It is monogamous: the male and female ſit in turns. The eggs are like thoſe of the common duck. When the young come forth, the mother will often carry them from the place of hatching to the water with her bill. They have been attempted to be domeſticated, by rearing the young under tame ducks; but without ſucceſs, as they ever are wild, effecting their eſcape the firſt opportunity: or if the old ones are taken and confined, they lay the eggs in a diſperſed manner, and never ſit. The voice is not unlike the note of a clarinet, while flying; at other times they cry like a peacock, eſpecially when kept tame; and now and then cluck like a hen. It is very choice of its mate; for if the male is killed, the female will not leave the gunner till ſhe has been two or three times ſhot at. The fleſh is thought very good food.

15. The bernicla, is of a brown colour; with the head, neck, and breaſt, black; and a white collar. Theſe birds, like the bernacles, frequent our coaſts in winter; and are particularly plenty, at times, on thoſe of Holland and Ireland, where they are taken in nets placed acroſs the rivers. In ſome ſeaſons they have reſorted to the coaſts of Picardy, in Franee, in ſuch prodigious flocks as to prove a peſt to the inhabitants, eſpecially in the winter of the year 1740, when theſe birds deſtroyed all the corn near the ſea-coaſts, by tearing it up by the roots. A general war was for this reaſon declared againſt them, and carried on in earneſt, by knocking them on the head with clubs; but their numbers were ſo prodigious, that this availed but little: nor were the inhabitants relieved from this ſcourge till the north wind, which had brought them, ceaſed to blow, when they took leave. They eaſily become tame; and, being fatted, are thought to be a delicate food. They breed pretty far north, returning ſouthward in autumn. They fly in the ſhape of a wedge, like the wild geeſe, with great clamour. They are called in Shetland, *Horra geeſe*, from being found in that ſound. They are common alſo in America; breeding in the iſlands, and along the coaſt, and feed about high-water mark. Their food conſiſts of plants, ſuch as the ſmall biſtort, and black-berried heath, ſea-worms, berries, and the like. They are apt to have a fiſhy taſte, but are in general thought good food. The ſame fable has been told of this bird as of the bernacle, in reſpect to its being bred from trees. Called at Hudſon's Bay, *Wetha may pa wew*.

16. The canadenſis is brown; its neck and head are black, and the throat is white. It meaſures three and a half feet in length. It is found during the ſummer in Hudſon's Bay, and parts beyond; alſo in Greenland; and, in the ſummer months, in various parts of North America, as far as Carolina. Numbers breed at Hudſon's Bay, and lay ſix or ſeven eggs; but the major part retire ſtill farther north. Their firſt appearance in the Bay is from about the middle of April to about the middle of May, when the inhabitants wait for them with impatience, being one of the chief articles for food, and many years kill as far as 3000 or 4000, which are ſalted and barrelled. Their arrival is the harbinger of ſpring, and the month is named by the Indians the *gooſe-moon*. The Britiſh ſend out their ſervants, as well as Indians, to ſhoot theſe birds on their paſſage. It is in vain to purſue them; they therefore form a row of huts made of boughs, at muſket-ſhot diſtance from each other, and place them in a line acroſs the vaſt marſhes of the country. Each hovel, or, as they are called, *ſtand*, is occupied by only a ſingle perſon. Theſe attend the flight of the birds, and on their approach mimic their cackle ſo well, that the geeſe will anſwer, and wheel, and come nearer the ſtand. The ſportſman keeps motionleſs, and on his knees, with his gun cocked, the whole time; and never fires till he has ſeen the eyes of the geeſe. He fires as they are going from him, then picks up another gun that lies by him, and diſcharges that. The geeſe which he has killed he ſets up on ſticks as if alive, to decoy others; he alſo makes artificial birds for the ſame purpoſe. In a good day (for they fly in very uncertain and unequal numbers) a ſingle Indian will kill 200. Notwithſtanding every ſpecies of gooſe has a different call, yet the Indians are admirable in their imitation of every one. In this ſport, however, they muſt be very careful to ſecrete themſelves; for the birds are very ſhy, and on the leaſt motion fly off directly. On their return ſouth, which is from the middle of Auguſt to the middle of October, much havoc is made among them; but theſe are preſerved freſh for winter ſtore, by putting them, feathers and all, into a large hole dug in the ground, and covering them with mould; and theſe, during the whole time of the froſt's laſting, are found perfectly ſweet and good. The Indians at Hudſon's Bay call them *Apiſtiſkiſh*. This ſpecies is now pretty common, in a tame ſtate, both on the continent and in England; on the great canal at Verſailles hundreds are ſeen mixing with the ſwans with the greateſt cordiality; and the ſame at Chantilly. In England, likewiſe, they are thought a great ornament to the pieces of water in many gentlemens ſeats, where they are very familiar, and breed freely. The fleſh of the young birds is accounted good; and the feathers equal to thoſe of other geeſe, inſomuch as to prove an article of commerce much in the favour of thoſe places where they are in ſufficient numbers.

17. The molliſſima, or eider-duck, is double the ſize of the common duck, has a cylindrical bill, and the wax

Anas. wax is divided behind, and wrinkled. The feathers, which are very soft and valuable, fall off during incubation. The male is white above, but black below and behind: the female is greenifh. This fpecies is found in the Weftern Ifles of Scotland, particularly on Oranfa, Barra, Rona, and Heifker, and on the Farn Ifles; but in greater numbers in Norway, Iceland, and Greenland; from whence a vaft quantity of the down, known by the name of *eider* or *edder*, which thefe birds furnifh, is annually imported. Its remarkably light, elaftic, and warm qualities, make it highly efteemed as a ftuffing for coverlets, by fuch whom age or infirmities render unable to fupport the weight of common blankets. This down is produced from the breaft of the birds in the breeding feafon. It lays its eggs among the ftones or plants near the fhore; and prepares a foft bed for them, by plucking the down from its own breaft: the natives watch the opportunity, and take away both eggs and neft: the duck lays again, and repeats the plucking of its breaft: if fhe is robbed after that, fhe will ftill lay; but the drakes muft fupply the down, as her ftock is now exhaufted: but if her eggs are taken a third time, fhe wholly deferts the place. See DOWN.

Thefe birds are not numerous on the ifles; and it is obferved that the drakes keep on thofe moft remote from the fitting places. The ducks continue on their nefts till you come almoft clofe to them; and when they rife, are very flow fliers. The number of eggs in each neft are from three to five, warmly bedded in the down; of a pale olive colour; and very large, gloffy, and fmooth. They now and then, however, lay fo many as eight; for Van Troil informs us, that no lefs than 16 have been found in one neft, with two females, who agree remarkably well together.— In America this bird is found as far fouth as New York, and breeds on the defert ifles of New England; but moft common every where to the north. They are faid to be conftant to the fame breeding places, and that a pair has been obferved to occupy the fame neft for 20 years together. They take their young on their backs inftantly to fea; then dive, to fhake them off and teach them to fhift for themfelves. It is faid, that the males are five years old before they come to their full colour; that they live to a great age, and will at length grow quite grey. Their food is fhells, for which they dive to great depths. They are very numerous in the Efquimaux lands, where and in Greenland they are called *mettek*. The natives kill them on the water with darts, ftriking them the moment they appear after diving; and know the place from their being preceded by the rifing of bubbles. The flefh is faid to be much valued.

18. The maula, or fcaup-duck, is lefs than the common duck. The bill is broad, flat, and of a greyifh blue colour; the head and neck are black, gloffed with green; the breaft is black; the back, the coverts of the wings, and the fcapulars, are finely marked with numerous narrow tranfverfe bars of black and grey; the legs are dufky. Mr Willughby acquaints us, that thefe birds take their name from feeding on fcaup, or broken fhell-fifh; they differ infinitely in colours, fo that in a flock of 40 or 50 there are not two alike.

19. The mofchata, or Mufcovy duck of Ray, has a naked papillous face, and is a native of India.—It is bigger than the wild duck, being in length two feet. This fpecies is pretty common in a domefticated ftate in almoft every nation; and the breed ought to be encouraged, as there is more flefh on it than on the common duck, and of a very high flavour. The eggs are rounder than thofe of a duck, and in young birds frequently incline to green. They lay more eggs, and fit oftener, than other ducks. In an unconfined ftate they make the neft on the ftumps of old trees, and perch during the heat of the day on the branches of fuch as are well clothed with leaves. When kept tame, they are fufficiently docile; and the male will not unfrequently affociate and produce a mongrel breed with the common ducks. The name of Mufcovy duck was given to them from their exhaling a mufky odour, which proceeds from the gland placed on the rump in common with other birds.

20. The clypeata, or fhoveler of Ray, has the end of its bill broad, rounded, and furnifhed with a fmall hook. It is in length 21 inches; the female a trifle fmaller. Both fexes are apt to vary much in colour: the male likewife differs from the female inwardly, having, juft above the divarication of the windpipe where it paffes into the lungs, an enlargement, or, as it is called by fome, a *labyrinth*.—This bird is now and then met with in England, though not in great numbers. It is faid to come into France in February, and fome of them to ftay during the fummer. It lays 10 or 12 rufous-coloured eggs, placed on a bed of rufhes, in the fame places as the fummer-teal; and departs in September, at leaft the major part of them, for it is rare that one is feen in the winter. The chief food is infects, for which it is continually muddling in the water with its bill. It alfo is faid dexteroufly to catch flies which pafs in its way over the water. Shrimps, among other things, have been found in its ftomach on diffection. This fpecies is alfo found in moft parts of Germany; throughout the Ruffian dominions, as far as Kamtfchatka; and in North America, in New York and Carolina during the winter feafon. With us it is accounted pretty good food.

21. The ftrepera, or gad-wall, has the wings variegated with black, white, and red. It inhabits England in the winter months, and is alfo found at the fame feafon in various parts of France and Italy. It migrates as far as Sweden as fummer advances in order to breed; and found throughout Ruffia and Siberia, except in the eaftern part of the laft, and Kamtfchatka. Being a very quick diver, it is difficult to be fhot. It feeds morning and evening only, being hid among the reeds and rufhes during the day. The noife it makes is not unlike that of the mallard, but louder. The flefh is good.

22. The clangula, or golden-eye of Ray, is variegated with black and white, and the head is interfperfed with blackifh green feathers: it has a white fpot near the mouth; and the eyes are of a fhining gold colour. It is not unfrequent on our fea-coafts in winter, and appears in fmall flocks; but paffes to the north in fpring in order to breed. It inhabits Sweden and Norway during the fummer. It is an excellent diver, and feeds on fmall fhells. It is moftly feen in the water, as it is very awkward in walking. It has been attempted to be domefticated, but feems out of its element on land. With difficulty it can be brought to eat any thing but bread; and the feet foon grow injured,

Anas.

titude, between the island of Java and St Paul, in the month of June.

7. The anser, *ferus et mansuetus;* or grey lag, and tame goose. The *grey lag* or *wild goose*, is two feet nine inches in length, and five feet in extent. The bill is large and elevated; of a flesh colour, tinged with yellow; the head and neck cinereous; breast and belly whitish, clouded with grey or ash colour; back, grey; the legs of a flesh colour. This species resides in the fens the whole year; breeds there, and hatches about eight or nine young, which are often taken, easily tamed, and esteemed most excellent meat, superior to the domestic goose. Towards winter they collect in great flocks, but in all seasons live and feed in the fens. On the continent they are migratory, changing place in large flocks, often 500 or more: in this case the flock is triangular in shape, with one point foremost; and as the goose which is first is tired soonest, it has been seen to drop behind, and another to take his place. In very small flocks, however, they are sometimes seen to follow one another in a direct line. Geese seem to be general inhabitants of the globe.

The *mansuetus*, is the grey lag in a state of domestication, and from which it varies in colour, though much less so than either the mallard or cock, being ever more or less verging to grey; though in all cases the whiteness of the vent, and upper tail coverts, is manifest. It is frequently found quite white, especially the males; and doubts have arisen, which of the two colours should have the preference in point of eating.—Tame geese are kept in great multitudes in the fens of Lincolnshire: a single person will have 1000 old geese, each of which will rear seven; so that towards the end of the season he will become master of 8000. During the breeding season these birds are lodged in the same houses with the inhabitants, and even in their very bedchambers: in every apartment are three rows of coarse wicker pens, placed one above another; each bird has its separate lodge divided from the other, which it keeps possession of during the time of sitting. A person, called a *gozzard*, i. e. *goose-herd*, attends the flock, and twice a-day drives the whole to water; then brings them back to their habitations, helping those that live in the upper stories to their nests, without ever misplacing a single bird. The geese are plucked five times in the year: the first plucking is at Lady-day, for feathers and quills; and the same is renewed, for feathers only, four times more between that and Michaelmas. The old geese submit quietly to the operation, but the young ones are very noisy and unruly. If the season proves cold, numbers of them die by this barbarous custom. Vast numbers of geese are driven annually to London to supply the markets; among them, all the superannuated geese and ganders, which, by a long course of plucking, prove uncommonly tough and dry.

The goose in general breeds only once in a year; but will frequently have two hatches in a season, if well kept. The time of sitting is about 30 days. They will also produce eggs sufficient for three broods, if they are taken away in succession. It is said to be very long-lived, as we have authority for their arriving at no less than 100 years.

The common price of geese in Wiltshire, is regulated by that of mutton, both being the same by the pound, without the feathers. The usual weight of a fine goose is 15 or 16 pounds; but it is scarce credible how far this may be increased by cramming them with bean-meal and other fattening diet. The victims destined for this surfeit are by some nailed to the floor by the webs of the feet, which causes no pain, and is meant to prevent the least possibility of action: to which, we are told, the French add the refinement of putting out their eyes; but what end this last piece of barbarity is meant to serve, is hard to conjecture. To what weight they arrive in France is not said; but we have been well informed, that 28 or even 30 pounds, is no uncommon thing in England.

8. The *bean-goose* is two feet seven inches in length; in extent four feet eleven. The bill, which is the chief distinction between this and the former, is small, much compressed near the end, whitish, and sometimes pale red in the middle, and black at the base and nail: the head and neck are cinereous brown, tinged with ferruginous; breast and belly, dirty white, clouded with cinereous; the back of a plain ash colour; feet and legs of a saffron colour; claws black. This species arrives in Lincolnshire in autumn; and is called the *bean-goose*, from the likeness of the nail of the bill to a horse-bean. They always light on corn-fields, and feed much on the green wheat. They never breed in the fens; but all disappear in May. They retreat to the sequestered wilds of the north of Europe; in their migration they fly a great height, cackling as they go. They preserve a great regularity in their motions; sometimes forming a straight line; at others, assuming the shape of a wedge, which facilitates their progress, for they cut the air readier in that form than if they flew pell-mell.

9. The erythropus, or laughing-goose of Edwards, is a native of Europe and America. The length of this species is about two feet four, the extent four feet six; the bill is elevated, of a pale yellow colour, with a white ring at the base; the forehead is white; the breast and belly are of a dirty white, marked with great spots of black; and the legs yellow. These visit the fens and other parts of England during winter, in small flocks; they keep always in marshy places, and never frequent the corn-lands. They disappear in the earliest spring, and none are seen after the middle of March. Linnæus makes this goose the female of the *bernacle;* but Mr Pennant thinks his opinion not well founded.

The *bernacle* (erythropus *mas*, Lin.) is two feet one inch in length, the breadth four feet five inches: the bill is black; the forehead and cheeks are white; from the bill to the eyes, there is a black line; the hind part of the head, the whole neck, and upper part of the breast and back, are of a deep black; the tail is black, the legs are of the same colour, and small. These birds appear in vast flocks during winter, on the north-west coasts of this kingdom: they are very shy and wild; but on being taken, grow in a few days as familiar as our tame geese. In February they quit our shores, and retire as far as Lapland, Greenland, and even Spitzbergen, to breed. They live to a great age: the Rev. Dr Buckworth of Spalding, had one which was kept in the family above 32 years, but was blind during the two last; what its age was when first taken, was unknown.

These are the birds that about 200 years ago were believed

Anas. believed to be generated out of wood, or rather a species of shell that is often found sticking to the bottoms of ships, or fragments of them; and were called *tree-geese* *. These were also thought by some writers to have been the *chenalopeces* of Pliny; they should have said *chenerotes*, for those were the birds which that naturalist said were found in Britain: but as he has scarce left us any description of them, it is difficult to say which species he intended. Mr Pennant imagines it to be the following; which is far inferior in size to the wild-goose, and very delicate food, in both respects suiting his description of the *cheneros*.

* See *Lepas*.

10. The race-horse or loggerhead goose, is in length 32 inches, and weighs from 20 to 30 pounds. The bill is three inches long, and of an orange colour: the irides are orange, surrounded with black, and then with orange: the head, neck, and upper parts of the body are of a deep ash-colour; the outer edge of the secondaries white, forming a band of the same on the wing: the under parts of the body dusky down the middle; over the thighs cinereous blue; vent white; quills and tail black: the wings are very short, not reaching to the rump: on the bend of the wing is a yellow knob, half an inch in length: the legs are brownish orange, the webs dusky, and the claws black. These inhabit Falkland Islands, Staaten Land, &c. and were mostly seen in pairs, though sometimes they were observed in large flocks. From the shortness of the wings they were unable to fly; but they made considerable use of them when in the water, on which they seemed as it were to run, at least they swam, with the assistance of the wings used as oars, at an incredible rate, insomuch that it was a most difficult thing to shoot them while on that element: to catch them, the sailors used to surround a flock with boats, and drive them on shore; where, unable to raise themselves from the ground, they ran very fast, but soon growing tired, and squatting down to rest, were easily overtaken, and knocked on the head. Their flesh was sometimes eaten by the sailors, in defect of that of the bustard goose; but it was not much relished, being rank and fishy, and thought more fit for the hogs, which ate it greedily, and fatted well upon it, boiled.

11. The snow-goose is in length two feet eight inches, and weighs between five and six pounds. The bill is somewhat serrated at the edges; the upper mandible scarlet, the lower whitish: the general colour of the plumage is snow white, except the first ten quills, which are black, with white shafts: the legs are of a deep red. The young are of a blue colour, till they are a year old. These are very numerous at Hudson's Bay, and called by the natives *Way-way*, and *Wapa whe whe*. They visit Severn River in May, and stay a fortnight; but go farther north to breed: they return to Severn Fort the beginning of September, and stay to the middle of October, when they depart for the south, and are observed to be attended with their young, in flocks innumerable. At this time many thousands are killed by the inhabitants; who pluck them, and take out the entrails, and putting the bodies into holes dug in the ground, cover them with earth, which freezing above them, keeps them perfectly sweet throughout the severe season; during which there is no more to do than occasionally to open one of these storehouses, when they find them sweet and good. They seem to occupy also the western side of America. In the summer months, they are plenty on the arctic coast of Sibiria, but never migrate beyond longitude 130. They are supposed to pass the winter in more moderate climes, as they have been seen flying at a great height over Silesia; probably on their passage to some other country, as it does not appear that they continue there. In like manner, those of America pass the winter in Carolina. Here they arrive in vast flocks; and feed on the roots of sage and grass, which they tear up like hogs. It used to be a common practice in that country to burn a piece of a marsh, which enticed the geese to come there, as they could then more readily get at the roots, which gave the sportsman opportunity of killing as many as he pleased. This species is the most numerous and the most stupid of all the goose race. They seem to want the instinct of others, by their arriving at the mouths of the Arctic Asiatic rivers before the season in which they can possibly subsist. They are annually guilty of the same mistake, and annually compelled to make a new migration to the south in quest of food, where they pass their time till the northern estuaries are freed from the bonds of ice. They have so little of the shyness of other geese, that they are taken in the most ridiculous manner imaginable, about Jakut, and the other parts of Siberia, which they frequent. The inhabitants first place, near the banks of the rivers, a great net, in a straight line, or else form a hovel of skins sewed together. This done, one of the company dresses himself in the skin of a white rein-deer, advances towards the flock of geese, and then turns back towards the net or the hovel; and his companions go behind the flock, and by making a noise drive them forward. The simple birds mistake the man in white for their leader, and follow him within reach of the net, which is suddenly pulled down and captivates the whole. When he chooses to conduct them to the hovel, they follow in the same manner; he creeps in at a hole left for that purpose, and out at another on the opposite side, which he closes up. The geese follow him through the first; and as soon as they are got in, he passes round, and secures every one.

12. The great goose is of a very large size, weighing near 25 or 30 Russian pounds. The bill is black; base of it tawny: body dusky: the under parts are white; the legs scarlet. It is found in the east of Siberia, from the river Lena to Kamtschatka; and is taken in great numbers, together with the red-necked goose, in glades, as we do woodcocks in England, but upon a larger scale.

13. The ruficollis, or red-breasted goose, is in length 21 inches; weight three pounds troy. The bill is small, and brown; the tail black: the irides are yellow brown; round the eyes, fringed with brown: fore part of the head and crown black, passing backwards in a narrow stripe quite to the back: on the breast is a narrow band of white feathers with black ends, forming a band of white and another of black: the sides are striped with black; back and wings black, the last even with the tail: legs black. This most elegant of geese is found to breed from the mouth of the Ob, along the coasts of the Icy sea, to that of the Lena. Its winter quarters are not certainly known. Small flocks are observed in the spring, flying from the Caspian sea along the Volga northward; and are seen about Zari-

 zyn,

ducks, do not prefer the wild fort, being in general extremely fond of tame ones: and it is faid that the major part of thefe are hatched by artificial heat; the eggs, being laid in boxes of fand, are placed on a brick hearth, to which is given a proper heat during the time required for hatching. The ducklings are fed with little craw-fifhes and crabs, boiled and cut fmall, and afterwards mixed with boiled rice; and in about a fortnight fhift for themfelves, when the Chinefe provide them an old ftepmother, who leads them where they are to find provender for themfelves; being firft put on board a fampane or boat, which is deftined for their habitation, and from which the whole flock, often to the amount of 300 or 400, go out to feed, and return at command. This method is ufed nine months out of the twelve (for in the colder months it does not fucceed); and is fo far from a novelty, that it may be every where feen; but more efpecially about the time of cutting the rice and gleaning the crop, when the mafters of the duck fampanes row up and down the river according to the opportunity of procuring food, which is found in plenty, at the tide of ebb, on the rich plantations, as they are overflowed at high water. It is curious to fee how the ducks obey their mafter; for fome thoufands, belonging to different boats, will feed at large on the fame fpot, and on a fignal given will follow their leader to their refpective fampanes, without a ftranger being found among them*. This is ftill more extraordinary, if we confider the number of inhabited fampanes on the Tigris, fuppofed to be no lefs than 40,000, which are moored in rows clofe to each other, with a narrow paffage at intervals for boats to pafs up and down the river. The Tigris, at Canton, is fomewhat wider than the Thames at London, and the whole river is there covered in this manner for the extent of at leaft a mile. See *Cook's laft voyage*, iii. 433.

* *Ofbec & Toreen's Voyage*, i. 194. ii. 255

33. The galericulata, or Chinefe teal of Edwards, has a hanging creft; and on the hinder part of the back, on both fides, there is a crooked, flat, elevated feather; the creft is green and red; and the back is brown, and fpotted with blue; and erect feathers on the back are red and blunt; one edge of the inmoft wing-feather, when the wings are fhut, is raifed over the back, and is red, and like a fickle before. This moft fingular and elegant fpecies is a native of China and Japan, where it is kept by the inhabitants for the fake of its beauty. It is not near fo common in China as many other kinds, or perhaps they are politically held dear to the European purchafers: they are frequently expofed to fale at Canton in cages, and the common price is from fix to ten dollars per pair: they are not unfrequently brought into England alive; but require care, as they feem more tender than our fpecies. Attempts have been made to breed them in this country, but without fuccefs, though they are familiar enough. The bird is known in Japan by the name of *Kimnodfui*. The Englifh in China give it the name of *mandarin duck*.

34. The fponfa, or fummer-duck of Catefby, is a moft elegant fpecies. It has a depending green creft, variegated with blue and white; the back is likewife variegated with blue and white; the breaft is grey, and fpotted with white; and the throat is white. It inhabits Mexico, and fome of the Weft India ifles, migrating in the fummer feafon as far north as 40 degrees, or a little beyond. It appears at New York early in the fpring, and breeds there; making its neft in the decayed hollows of trees, or fuch as have been made by woodpeckers, and often between the forks of the branches; and when the young are hatched, the mother takes them on her back to the water. The flefh is much efteemed by the Americans. This is the fpecies, the neck of which the natives of Louifiana ufe to ornament their pipes or calumets of peace with; and at the laft-named place it is found throughout the year. Thefe birds are often kept tame in our menageries, and will breed there.

35. The arborea, or black-billed whiftling duck of Edwards, is of a reddifh brown colour, with a fort of creft on the head; the belly is fpotted with black and white. It is a native of America. Sloane informs us, that this duck perches on trees; that it is about 20 inches long from the end of the bill to the point of the tail; and that it makes a kind of whiftling noife, from which circumftance it has received its name.

36. The fuligula, or tufted duck of Ray, has a hanging creft, a black body, and the wings and belly fpotted with white. This fpecies is found in Europe as far as Norway. In the winter months it is not unfrequent in England; being met with in the markets in that feafon, and is much efteemed. It is common alfo throughout the Ruffian empire, going northward to breed. Is frequent in Kamtfchatka. The male difappears during the incubation of the female.

There are 62 other fpecies enumerated by ornithologifts; the whole number hitherto defcribed being 98.

ANASARCA, a fpecies of dropfy. See MEDICINE.

ANASSUS, or ANAXUS (anc. geog.), a river in the territory of Venice, (Pliny); now the *Piave*, which rifing from the mountains of Tyrol, not far from the borders of Carinthia, runs from north to fouth, through the territories of Cadorina, Belluno, Feltre, and, after running from weft to eaft, through Trevigi, falls into the Adriatic, 13 miles to the fouth-eaft of Venice.

ANASTASIS, a term among ancient phyficians, for a rifing up to go to ftool. It alfo fignifies the paffage of any humour, when expelled from one part, and obliged to remove to another.

ANASTASIUS I. emperor of the Eaft, fucceeded Zeno in the year 491, and was inaugurated that fame year on April the 11th. The Manicheans and Arians were greatly in hopes of being fupported by the new emperor; the former becaufe his mother was their friend, and favoured their fect; the latter becaufe the emperor's uncle was of their opinion: but if Anaftafius did not perfecute them (as we do not find he ever did), yet it does not appear that he fupported either of thefe fects. But in order to maintain the peace of the church, upon which the tranquillity of the ftate very much depends, he declared, that fuch bifhops or other clergymen who fhould difturb the public tranquillity, by maintaining with too much heat either fide of the queftion for or againft the council of Chalcedon, fhould be deprived of their benefices. Accordingly the difputes concerning Eutychianifm running to a very great height, and Euphemius being deeply con-

cerned in them, the emperor expelled him from his ſee, and choſe Macedonius in his ſtead. The hatred which the different parties entertained againſt one another occaſioned often ſuch tumults and ſeditions at Conſtantinople, as threatened the life of the emperor himſelf; who, to keep the people in awe, ordered that the governor of the city ſhould be preſent at all church-aſſemblies and public proceſſions. This was ſo much the more neceſſary, becauſe theſe tumults were chiefly occaſioned by a kind of doxology or ſhort hymn which uſed to be ſung at divine ſervice. This doxology conſiſted only of the following words, αγιος ο Θεος, αγιος ισχυρος, αγιος αθανατος, that is, "Holy God, holy the powerful, holy the immortal;" for which reaſon it was called τρισαγιος, *Triſagius*, "three times holy;" becauſe the word *holy* was therein three times repeated. The orthodox uſed to ſing that hymn without any addition, or by adding only to it, αγια τριας, ελεησον ημας, i. e. "Holy Trinity, have mercy upon us:" But Peter the Fuller, biſhop of Antioch, pretended to add theſe words to it, viz. ο σταυρωθεις δι ημας, i. e. "who haſt been crucified for us;" and as it was ſuppoſed that the firſt holy related to the Father, the ſecond to the Son, the third to the Holy Ghoſt, the adding theſe words, *who haſt been crucified for us*, ſeemed to inſinuate that the whole conſubſtantial Trinity had ſuffered; for which reaſon the orthodox were reſolved not to admit this addition. Anaſtaſius deſiring to have thoſe fatal words added to that hymn whenever it ſhould be ſung at Conſtantinople, this occaſioned a terrible ſedition in the city, as though the very fundamentals of Chriſtianity had been overthrown. Macedonius and his clergy are ſaid to have raiſed that ſedition, which came to ſuch a height that the emperor himſelf was obliged to come, without his crown on his head, and in a very humble manner, to the Circus, where he declared to the people that he was very willing to quit the imperial throne; but he told them at the ſame time, that they could not all enjoy the ſovereign power, which does not admit of a partnerſhip; and that one perſon ſtill muſt govern them if he reſigned the crown. This diſcourſe had ſuch a power over the raging multitude, that, as if they had been divinely inſpired, they immediately requeſted the emperor to take up his crown, promiſing that they would be quiet and obedient for the future. Anaſtaſius is by the Popiſh writers repreſented as a great perſecutor of the orthodox, becauſe he baniſhed and deprived Euphemius and Macedonius; but they ſhould prove that theſe two prelates had been unjuſtly baniſhed, which is a very hard taſk. As to his civil government, it is confeſſed that at the beginning of his reign he ſhowed himſelf a very good prince; he eaſed the people of a very heavy tax called *Chryſargyrum*, under which they had groaned for a long time; he prohibited the fighting with wild beaſts; he raiſed ſeveral buildings; he avoided being involved in dangerous wars as much as lay in his power. Anaſtaſius reigned 27 years three months and three days, or, according to F. Pagi, wanting three days; and died July the 10th, A. C. 518, in the 88th year of his age.

Anastasius, ſurnamed *Bibliothecarius*, a Roman abbot, library-keeper of the Vatican, and one of the moſt learned men of the ninth century, aſſiſted in 869 at the fourth general council, the acts and canons of which he tranſlated from the Greek into Latin. He alſo compoſed the lives of ſeveral popes, and other works; the beſt edition of which is that of the Vatican.

ANASTATICA, the rose of Jericho: A genus of the ſiliculoſa order, belonging to the tetradynamia claſs of plants; and, in the natural method, ranking under the 39th order, *Siliquoſæ*. The characters are: The *calyx* is a perianthium conſiſting of four leaves, and perſiſtent: The *corolla* conſiſts of four cruciform petals: The *ſtamina* conſiſt of ſix ſubulated filaments the length of the calyx; the antheræ are roundiſh: The *piſtillum* has a ſmall bifid germen; the ſtylus mucronated and oblique; the ſtigma headed: The *pericarpium* is a ſhort bilocular ſilicle, retuſe, and crowned on the margin with valvulæ twice as long as the partition: The *ſeeds* are ſolitary and roundiſh.—Of this genus there are two

Species. 1. The ſyriaca, a native of Syria, is not cultivated or known in Britain. 2. The hierochuntica is a native of the ſandy parts of Paleſtine and the Red Sea. It is a low annual plant, dividing into many irregular woody branches near the root. At each joint is placed a ſingle, oblong, hairy leaf; and at the ſame places come out ſmall ſingle flowers, of a whitiſh green colour, compoſed of four leaves placed in the form of a croſs. Theſe are ſucceeded by ſhort wrinkled pods, having four ſmall horns; theſe open into four cells, in each of which is lodged a ſingle brown ſeed.—When the ſeeds of this plant are ripe, the branches will draw up and contract; ſo that the whole plant forms a kind of ball or globular body, which will expand on laying it a ſhort time in warm water. This property it retains for many years, on which account it is preſerved as a curioſity by ſome people. From this property the monks have given it the name of *Roſa Mariæ*, pretending that the flowers open on the night in which our Saviour was born.

Culture. This plant is propagated by ſeeds, which ſhould be ſown in the beginning of March, in a moderate hot-bed in pots, in which the plants are deſigned to remain. When they come up, the plants ſhould be thinned, leaving them about ſix inches aſunder, and obſerving to keep them clear of weeds, which is all the care they require. If the ſeaſon proves favourable, they will flower in Auguſt; but unleſs the autumn proves warm and dry, they will not perfect their ſeeds in Britain.

ANASTOMOSIS, in anatomy, the opening of the mouths of veſſels, in order to diſcharge their contained fluids. It is likewiſe uſed for the communication of two veſſels at their extremities; as the inoſculation of a vein with a vein, of an artery with an artery, or of an artery with a vein.

ANASTOMATICS, medicines ſuppoſed to have the power of opening the mouths of the veſſels, and promoting the circulation; ſuch as deobſtruent, cathartic, and ſudorific medicines.

ANASTROPHE, in rhetoric and grammar, denotes the inverſion of the natural order of the words: ſuch is, *ſaxa per et ſcopulos*, for *per ſaxa et ſcopulos*.

ANASUS, or Anisus (anc. geog.), now the *Ens*, a river of Germany; which, riſing on the borders of the

the territory of Saltzburg, then ſeparating Upper Stiria from Upper Auſtria, and waſhing the town of Ens, falls, at the diſtance of a mile below it, into the Danube, in a courſe from ſouth to north.

ANATHEMA, among eccleſiaſtical writers, imports whatever is ſet apart, ſeparated, or divided; but is moſt uſually meant to expreſs the cutting off a perſon from the privileges of ſociety and communion with the faithful.

The anathema differs from excommunication in the circumſtances of being attended with curſes and execrations. It was practiſed in the primitive church againſt notorious offenders; and the form of that pronounced by Synecius againſt one Andronicus, is as follows: "Let no church of God be open to Andronicus, but let every ſanctuary be ſhut againſt him. I admoniſh both private men and magiſtrates, to receive him neither under their roof nor to their table; and prieſts more eſpecially, that they neither converſe with him living, nor attend his funeral when dead."

Several councils alſo have pronounced anathemas againſt ſuch as they thought corrupted the purity of the faith; and their deciſions have been conceived in the following form: *Si quis dixerit, &c. anathema ſit.*

There are two kinds of anathemas, the one judiciary, and the other abjuratory. The former can only be denounced by a council, a pope, or a biſhop; the latter makes a part of the ceremony of abjuration, the convert being obliged to anathematize the hereſy he abjures.

Anathema, in heathen antiquity, was an offering or preſent made to ſome deity, and hung up in the temple. Whenever a perſon left off his employment, it was uſual to dedicate the tools to the patron-deity of the trade. Perſons too who had eſcaped from imminent danger, as ſhipwreck and the like, or had met with any other remarkable inſtance of good fortune, ſeldom failed to teſtify their gratitude by ſome preſent of this kind.

ANATHOTH, a hamlet of Paleſtine, very near Jeruſalem (Joſephus), about three miles and a half to the north; the ruins of which are ſtill to be ſeen. It was the birth-place of the prophet Jeremiah, and one of the Levitical towns in the tribe of Benjamin.

ANATIFERA concha, the trivial name of a ſpecies of the lepas, a teſtaceous animal. See Lepas.

ANATOCISM, Anatocismus, an uſurious contract, wherein the intereſts ariſing from the principal ſum are added to the principal itſelf, and intereſt exacted upon the whole. The word is originally Greek, but uſed by Cicero in Latin; whence it is deſcended into moſt other languages. It comes from the prepoſition ανα, which in compoſition ſignifies *repetition* or *duplication*, and τοκος, *uſury*. Anatociſm is what we properly call *intereſt upon intereſt*, or *compound intereſt*. This is the worſt kind of uſury, and has been ſeverely condemned by the Roman law, as well as by the common laws of moſt other countries. See Interest.

ANATOLIA. See Natolia.

A N A T O M Y.

THE art of diſſecting, or artificially ſeparating and taking to pieces, the different parts of the human body, in order to an exact diſcovery of their ſituation, ſtructure, and œconomy.—The word is Greek, ανατομη; derived from ανατεμνω, to diſſect, or ſeparate by cutting.

INTRODUCTION.

§ 1. *Hiſtory of Anatomy.*

This art ſeems to have been very ancient; though, for a long time, known only in an imperfect manner.—The firſt men who lived muſt have ſoon acquired ſome notions of the ſtructure of their own bodies, particularly of the external parts, and of ſome even of the internal, ſuch as bones, joints, and ſinews, which are expoſed to the examination of the ſenſes in living bodies.

This rude knowledge muſt have been gradually improved, by the accidents to which the body is expoſed, by the neceſſities of life, and by the various cuſtoms, ceremonies, and ſuperſtitions, of different nations. Thus, the obſervance of bodies killed by violence, attention to wounded men, and to many diſeaſes, the various ways of putting criminals to death, the funeral ceremonies, and a variety of ſuch things, muſt have ſhown men every day more and more of themſelves; eſpecially as curioſity and ſelf-love would here urge them powerfully to obſervation and reflection.

The brute-creation having ſuch an affinity to man in outward form, motions, ſenſes, and ways of life; the generation of the ſpecies, and the effect of death upon the body, being obſerved to be ſo nearly the ſame in both; the concluſion was not only obvious, but unavoidable, that their bodies were formed nearly upon the ſame model. And the opportunities of examining the bodies of brutes were ſo eaſily procured, indeed ſo neceſſarily occurred in the common buſineſs of life, that the huntſman in making uſe of his prey, the prieſt in ſacrificing, the augur in divination, and above all, the butcher, or thoſe who might out of curioſity attend upon his operations, muſt have been daily adding to the little ſtock of anatomical knowledge. Accordingly we find, in fact, that the South-ſea-iſlanders, who have been left to their own obſervation and reaſoning, without the aſſiſtance of letters, have yet a conſiderable ſhare of rude or wild anatomical and phyſiological knowledge. Dr Hunter informs us, that when Omai was in his muſeum with Mr Banks, though he could not explain himſelf intelligibly, they plainly ſaw that he knew the principal parts of the body, and ſomething likewiſe of their uſes; and manifeſted a great curioſity or deſire of having the functions of the internal parts of the body explained to him; particularly the relative functions of the two ſexes, which with him ſeemed to be the moſt intereſting object of the human mind.

We may further imagine, that the philoſophers of the

the moſt early ages, that is, the men of curioſity, obſervation, experience, and reflection, could not overlook an inſtance of natural organization, which was ſo intereſting, and at the ſame time ſo wonderful, more eſpecially ſuch of them as applied to the ſtudy and cure of diſeaſes. We know that phyſic was a branch of philoſophy till the age of Hippocrates.

Thus the art muſt have been circumſtanced in its beginning. We ſhall next ſee from the teſtimony of hiſtorians and other writers, how it actually appeared as an art, from the time that writing was introduced among men; how it was improved, and conveyed down to us through a long ſeries of ages.

Civilization, and improvements of every kind, would naturally begin in fertile countries and healthful climates, where there would be leiſure for reflection, and an appetite for amuſement. Accordingly, writing, and many other uſeful and ornamental inventions and arts, appear to have been cultivated in the eaſtern parts of Aſia long before the earlieſt times that are treated of by the Greek or other European writers; and that the arts and learning of thoſe eaſtern people were in ſubſequent times gradually communicated to adjacent countries, eſpecially by the medium of traffic. The cuſtoms, ſuperſtitions, and climate of eaſtern countries, however, appear to have been as unfavourable to practical anatomy as they were inviting to the ſtudy of aſtronomy, geometry, poetry, and all the ſofter arts of peace.

Animal bodies there run ſo quickly into nauſeous putrefaction, that the early inhabitants muſt have avoided ſuch offenſive employments as anatomical inquiries, like their poſterity at this day. And in fact it does not appear, by the writings of the Grecians, or Jews, or Phœnicians, or of other eaſtern countries, that anatomy was particularly cultivated by any of thoſe eaſtern nations. In tracing it backwards to its infancy, we cannot go farther into antiquity than the times of the Grecian philoſophers. As an art in the ſtate of ſome cultivation, it may be ſaid to have been brought forth and bred up among them as a branch of natural knowledge.

The æra of philoſophy, as it was called, began with Thales the Mileſian being declared by a very general conſent of the people, the moſt wiſe of all the Grecians, 480 years before Chriſt. The philoſophers of his ſchool, which was called the Ionian, cultivated principally natural knowledge. Socrates, the ſeventh in ſucceſſion of their great teachers, introduced the ſtudy of morals, and was thence ſaid to bring down philoſophy from heaven, to make men truly wiſe and happy.

In the writings of his ſcholar and ſucceſſor Plato, we ſee that the philoſophers had carefully conſidered the human body, both in its organization and functions; and though they had not arrived at the knowledge of the more minute and intricate parts, which required the ſucceſſive labour and attention of many ages, they had made up very noble and comprehenſive ideas of the ſubject in general. The anatomical deſcriptions of Xenophon and Plato have had the honour of being quoted by Longinus (§ xxxii.) as ſpecimens of ſublime writing; and the extract from Plato is ſtill more remarkable for its containing the rudiments of the circulation of the blood. "The heart (ſays Plato) is the centre or knot of the blood-veſſels; the ſpring or fountain of the blood, which is carried impetuouſly round; the blood is the *pabulum* or food of the fleſh; and for the purpoſe of nouriſhment, the body is laid out into canals, like thoſe which are drawn through gardens, that the blood may be conveyed, as from a fountain, to every part of the pervious body."

Hippocrates was nearly contemporary with the great philoſophers of whom we have been ſpeaking, about 400 years before the Chriſtian æra. He is ſaid to have ſeparated the profeſſion of philoſophy and phyſic, and to have been the firſt who applied to phyſic alone as the buſineſs of his life. He is likewiſe generally ſuppoſed to be the firſt who wrote upon anatomy. We know of nothing that was written expreſsly upon the ſubject before; and the firſt anatomical diſſection which has been recorded, was made by his friend Democritus of Abdera.

If, however, we read the works of Hippocrates with impartiality, and apply his accounts of the parts to what we now know of the human body, we muſt allow his deſcriptions to be imperfect, incorrect, ſometimes extravagant, and often unintelligible, that of the bones only excepted. He ſeems to have ſtudied theſe with more ſucceſs than the other parts, and tells us that he had an opportunity of ſeeing an human ſkeleton.

From Hippocrates to Galen, who flouriſhed towards the end of the ſecond century, in the decline of the Roman empire, that is, in the ſpace of 600 years, anatomy was greatly improved; the philoſophers ſtill conſidering it as a moſt curious and intereſting branch of natural knowledge, and the phyſicians as a principal foundation of their art. Both of them, in that interval of time, contributed daily to the common ſtock, by more accurate and extended obſervations, and by the lights of improving philoſophy.

As theſe two great men had applied very particularly to the ſtudy of animal bodies, they not only made great improvements, eſpecially in phyſiology, but raiſed the credit of natural knowledge, and ſpread it as wide as Alexander's empire.

Few of Ariſtotle's writings were made public in his lifetime. He affected to ſay that they would be unintelligible to thoſe who had not heard them explained at his lectures: and, except the uſe which Theophraſtus made of them, they were loſt to the public for above 130 years after the death of Theophraſtus; and at laſt came out defective from bad preſervation, and corrupted by men, who, without proper qualifications, preſumed to correct and to ſupply what was loſt.

From the time of Theophraſtus, the ſtudy of natural knowledge at Athens was for ever on the decline; and the reputation of the Lycæum and Academy was almoſt confined to the ſtudies which are ſubſervient to oratory and public ſpeaking.

The other great inſtitution for Grecian education, was at Alexandria in Egypt. The firſt Ptolemies, both from their love of literature, and to give true and permanent dignity to their empire, and to Alexander's favourite city, ſet up a grand ſchool in the palace itſelf, with a muſeum and a library, which, we may ſay, has been the moſt famed in the world. Anatomy, among other ſciences, was publicly taught; and the two diſtinguiſhed anatomiſts were Eraſiſtratus the pupil and friend of Theophraſtus, and Herophilus. Their

voluminous works are all loft; but they are quoted by Galen almoft in every page. Thefe profeffors were probably the firft who were authorized to diffect human bodies; a peculiarity which marks ftrongly the philofophical magnanimity of the firft Ptolemy, and fixes a great æra in the hiftory of anatomy. And it was, no doubt, from this particular advantage which the Alexandrians had above all others, that their fchool not only gained, but for many centuries preferved, the firft reputation for medical education. Ammianus Marcellinus, who lived about 650 years after the fchools were fet up, fays, they were fo famous in his time, that it was enough to fecure credit to any phyfician, if he could fay that he had ftudied at Alexandria.

Herophilus has been faid to have anatomized 700 bodies. We muft allow for exaggeration. Nay, it was faid, that both he and Erafiftratus made it a common practice to open living bodies, that they might difcover the more fecret fprings of life. But this, no doubt, was only a vulgar opinion, rifing from the prejudices of mankind; and accordingly, without any good reafon, fuch tales have been told of modern anatomifts, and have been believed by the vulgar.

Among the Romans, though it is probable they had phyficians and furgeons from the foundation of the city, yet we have no account of any of thefe applying themfelves to anatomy for a very long time. Archagathus was the firft Greek phyfician eftablifhed in Rome, and he was banifhed the city on account of the feverity of his operations.—Afclepiades, who flourifhed in Rome 101 years after Archagathus, in the time of Pompey, attained fuch a high reputation as to be ranked in the fame clafs with Hippocrates. He feemed to have fome notion of the air in refpiration acting by its weight; and in accounting for digeftion, he fuppofed the food to be no farther changed than by a comminution into extremely fmall parts, which being diftributed to the feveral parts of the body, is affimilated to the nature of each. One Caffius, commonly thought to be a difciple of Afclepiades, accounted for the right fide of the body becoming paralytic on hurting the left fide of the brain, in the fame manner as has been done by the moderns, viz. from the croffing of the nerves from the right to the left fide of the brain.

From the time of Afclepiades to the fecond century, phyficians feem to have been greatly encouraged at Rome; and in the writings of Celfus, Rufus, Pliny, Cœlius Aurelianus, and Aræteus, we find feveral anatomical obfervations, but moftly very fuperficial and inaccurate. Towards the end of the fecond century lived Claudius Gallenus Pergamus, whofe name is fo well known in the medical world. He applied himfelf particularly to the ftudy of anatomy, and did more in that way than all that went before him. He feems, however, to have been at a great lofs for human fubjects to operate upon; and therefore his defcriptions of the parts are moftly taken from brute animals. His works contain the fulleft hiftory of anatomifts, and the moft complete fyftem of the fcience, to be met with any where before him, or for feveral centuries after; fo that a number of paffages in them were reckoned abfolutely unintelligible for many ages, until explained by the difcoveries of fucceeding anatomifts.

About the end of the fourth century, Nimefius bifhop of Emiffa wrote a treatife on the nature of man, in which it is faid were contained two celebrated modern difcoveries; the one, the ufes of the bile, boafted of by Sylvius de la Boe; and the other, the circulation of the blood. This laft, however, is proved by Dr Friend, in his Hiftory of Phyfic, p. 229. to be falfely afcribed to this author.

The Roman empire beginning now to be oppreffed by the barbarians, and funk in grofs fuperftition, learning of all kinds decreafed; and when the empire was totally overwhelmed by thofe barbarous nations, every appearance of fcience was almoft extinguifhed in Europe. The only remains of it were among the Arabians in Spain and in Afia.—The Saracens, who came into Spain, deftroyed at firft all the Greek books which the Vandals had fpared: but though their government was in a conftant ftruggle and fluctuation during 800 years before they were driven out, they received a tafte for learning from their countrymen of the eaft; feveral of their princes encouraged liberal ftudies; public fchools were fet up at Cordova, Toledo, and other towns, and tranflations of the Greeks into the Arabic were univerfally in the hands of their teachers.

Thus was the learning of the Grecians transferred to the Arabians. But though they had fo good a foundation to build upon, this art was never improved while they were mafters of the world: for they were fatisfied with commenting upon Galen; and feem to have made no diffections of human bodies.

Abdollaliph, who was himfelf a teacher of anatomy, a man eminent in his time (at and before 1203) for his learning and curiofity; a great traveller, who had been bred at Bagdad, and had feen many of the great cities and principal places for ftudy in the Saracen empire; who had a favourable opinion of original obfervation, in oppofition to book-learning; who boldly corrected fome of Galen's errors, and was perfuaded that many more might be detected; this man, we fay, never made or faw, or feemed to think of a human diffection. He difcovered Galen's errors in the ofteology, by going to burying-grounds, with his ftudents and others, where he examined and demonftrated the bones; he earneftly recommended that method of ftudy, in preference even to the reading of Galen, and thought that many farther improvements might be made; yet he feemed not to have an idea that a frefh fubject might be diffected with that view.

Perhaps the Jewifh tenets which the Mahometans adopted about uncleanlinefs and pollution, might prevent their handling dead bodies; or their opinion of what was fuppofed to pafs between an angel and the dead perfon, might make them think difturbing the dead highly facrilegious. Such, however, as Arabian learning was, for many ages together there was hardly any other in all the weftern countries of Europe. It was introduced by the eftablifhment of the Saracens in Spain in 711, and kept its ground till the reftoration of learning in the end of the 15th century. The ftate of anatomy in Europe, in the times of Arabian influence, may be feen by reading a very fhort fyftem of anatomy drawn up by Mundinus, in the year 1315. It was extracted principally from what the Arabians had preferved of Galen's doctrine; and, rude as it is, in that age, it was judged to be fo mafterly a performance, that it was ordered by a public decree, that it fhould be read in all the fchools of Italy; and it actually continued

tinued to be almost the only book which was read upon the subject for above 200 years. Cortesius gives him the credit of being the great restorer of anatomy, and the first who dissected human bodies among the moderns.

A general prejudice against dissection, however, prevailed till the 16th century. The emperor Charles V. ordered a consultation to be held by the divines of Salamanca, in order to determine whether or not it was lawful in point of conscience to dissect a dead body. In Muscovy, till very lately, both anatomy and the use of skeletons were forbidden, the first as inhuman, and the latter as subservient to witchcraft.

In the beginning of the 15th century, learning revived considerably in Europe, and particularly physic, by means of copies of the Greek authors brought from the sack of Constantinople; after which the number of anatomists and anatomical books increased to a prodigious degree.—The Europeans becoming thus possessed of the ancient Greek fathers of medicine, were for a long time so much occupied in correcting the copies they could obtain, studying the meaning, and commenting upon them, that they attempted nothing of their own, especially in anatomy.

And here the late Dr Hunter introduces into the annals of this art, a genius of the first rate, Leonardo da Vinci, who had been formerly overlooked, because he was of another profession, and because he published nothing upon the subject. He is considered by the Doctor as by far the best anatomist and physiologist of his time; and was certainly the first man we know of who introduced the practice of making anatomical drawings.

Vassare, in his lives of the painters, speaks of Leonardo thus, after telling us that he had composed a book of the anatomy of a horse, for his own study: "He afterwards applied himself with more diligence to the human anatomy; in which study he reciprocally received and communicated assistance to Marc. Antonio della Torre, an excellent philosopher, who then read lectures in Pavia, and wrote upon this subject; and who was the first, as I have heard, who began to illustrate medicine from the doctrine of Galen, and to give true light to anatomy, which till that time had been involved in clouds of darkness and ignorance. In this he availed himself exceedingly of the genius and labour of Leonardo, who made a book of studies, drawn with red chalk, and touched with a pen, with great diligence, of such subjects as he had himself dissected; where he made all the bones, and to those he joined, in their order, all the nerves, and covered them with the muscles. And concerning those, from part to part, he wrote remarks in letters of an ugly form, which are written by the left hand, backwards, and not to be understood but by those who know the method of reading them; for they are not to be read without a looking-glass. Of these papers of the human anatomy, there is a great part in the possession of M. Francesco da Melzo, a Milanese gentleman, who, in the time of Leonardo, was a most beautiful boy, and much beloved by him, as he is now a beautiful and genteel old man, who reads those writings, and carefully preserves them, as precious relicts, together with the portrait of Leonardo, of happy memory. It appears impossible that that divine spirit should reason so well upon the arteries, and muscles, and nerves, and veins; and with such diligence of every thing, &c. &c."

Those very drawings and the writings are happily found to be preserved in his Majesty's great collection of original drawings, where the Doctor was permitted to examine them; and his sentiments upon the occasion he thus expresses: "I expected to see little more than such designs in anatomy, as might be useful to a painter in his own profession; but I saw, and indeed with astonishment, that Leonardo had been a general and a deep student. When I consider what pains he has taken upon every part of the body, the superiority of his universal genius, his particular excellence in mechanics and hydraulics, and the attention with which such a man would examine and see objects which he was to draw, I am fully persuaded that Leonardo was the best anatomist at that time in the world. We must give the 15th century the credit of Leonardo's anatomical studies, as he was 55 years of age at the close of that century."

In the beginning of the 16th century, Achillinus and Benedictus, but particularly Berengarius and Massa, followed out the improvement of anatomy in Italy, where they taught it, and published upon the subject. These first improvers made some discoveries from their own dissections: but it is not surprising that they should have been diffident of themselves, and have followed Galen almost blindly, when his authority had been so long established, and when the enthusiasm for Greek authors was rising to such a pitch.

Soon after this, we may say about the year 1540, the great Vesalius appeared. He was studious, laborious, and ambitious. From Brussels, the place of his birth, he went to Louvain, and thence to Paris, where anatomy was not yet making a considerable figure, and then to Louvain to teach; from which place, very fortunately for his reputation, he was called to Italy, where he met with every opportunity that such a genius for anatomy could desire, that is, books, subjects, and excellent draughtsmen. He was equally laborious in reading the ancients, and in dissecting bodies. And in making the comparison, he could not but see, that there was great room for improvement, and that many of Galen's descriptions were erroneous. When he was but a young man, he published a noble system of anatomy, illustrated with a great number of elegant figures.—In this work he found so many occasions of correcting Galen, that his contemporaries, partial to antiquity, and jealous of his reputation, complained that he carried his turn for improvement and criticisms to licentiousness. The spirit of opposition and emulation was presently roused; and Sylvius in France, Columbus, Fallopius, and Eustachius in Italy, who were all in high anatomical reputation about the middle of this 16th century, endeavoured to defend Galen at the expence of Vesalius. In their disputes they made their appeals to the human body: and thus in a few years the art was greatly improved. And Vesalius being detected in the very fault which he condemns in Galen, to wit, describing from the dissections of brutes, and not of the human body, it exposed so fully that blunder of the older anatomists, that in succeeding times there has been little reason for such complaint.—Besides the above, he published several other anatomical treatises. He has been particularly serviceable by imposing

posing names on the muscles, most of which are retained to this day. Formerly they were distinguished by numbers, which were differently applied by almost every author.

In 1561, Gabriel Fallopius, professor of anatomy at Padua, published a treatise of anatomy under the title of *Observationes Anatomicæ*. This was designed as a supplement to Vesalius; many of whose descriptions he corrects, though he always makes mention of him in an honourable manner. Fallopius made many great discoveries, and his book is well worth the perusal of every anatomist.

In 1563, Bartholomæus Eustachius published his *Opuscula Anatomica* at Venice, which have ever since been justly admired for the exactness of the descriptions, and the discoveries contained in them. He published afterwards some other pieces, in which there is little of anatomy; but never published the great work he had promised, which was to be adorned with copperplates representing all the parts of the human body. These plates, after lying buried in an old cabinet for upwards of 150 years, were at last discovered and published in the year 1714, by Lancisi the pope's physician; who added a short explicatory text, because Eustachius's own writing could not be found.

From this time the study of anatomy gradually diffused itself over Europe; insomuch that for the last hundred years it has been daily improving by the labour of a number of professed anatomists almost in every country of Europe.

We may form a judgment about the state of anatomy even in Italy, in the beginning of the 17th century, from the information of Cortesius. He had been professor of anatomy at Bologna, and was then professor of medicine at Massana; where, though he had a great desire to improve himself in the art, and to finish a treatise which he had begun on practical anatomy, in 24 years he could twice only procure an opportunity of dissecting a human body, and then it was with difficulties and in hurry; whereas he had expected to have done so, he says, *once every year, according to the custom in the famous academies of Italy*.

In the very end of the 16th century, our great Harvey, as was the custom of the times, went to Italy to study medicine; for Italy was still the favourite seat of the arts: And in the very beginning of the 17th century, soon after Harvey's return to England, his master in anatomy, Fabricius ab Aquapendente, published an account of the valves in the veins, which he had discovered many years before, and no doubt taught in his lectures when Harvey attended them.

This discovery evidently affected the established doctrine of all ages, that the veins carried the blood from the liver to all parts of the body for nourishment. It set Harvey to work upon the use of the heart and vascular systems in animals; and in the course of some years he was so happy as to discover, and to prove beyond all possibility of doubt, the *circulation of the blood*. He taught his new doctrine in his lectures about the year 1616, and printed it in 1628.

It was by far the most important step that has been made in the knowledge of animal bodies in any age. It not only reflected useful lights upon what had been already found out in anatomy, but also pointed out the means of further investigation. And accordingly we see, that from Harvey to the present time, anatomy has been so much improved, that we may reasonably question if the ancients have been further outdone by the moderns in any other branch of knowledge. From one day to another there has been a constant succession of discoveries, relating either to the structure or functions of our body; and new anatomical processes, both of investigation and demonstration, have been daily invented. Many parts of the body which were not known in Harvey's time have since then been brought to light: and of those which were known, the internal composition and functions remained unexplained; and indeed must have remained unexplicable without the knowledge of the circulation.

Harvey's doctrine at first met with considerable opposition; but in the space of about 20 years it was so generally and so warmly embraced, that it was imagined every thing in physic would be explained. But time and experience have taught us, that we still are, and probably must long continue to be, very ignorant; and that in the study of the human body, and of its diseases, there will always be an extensive field for the exercise of sagacity.

After the discovery and knowledge of the circulation of the blood, the next question would naturally have been about the passage and route of the nutritious part of the food or chyle from the bowels to the blood-vessels: And, by good fortune, in a few years after Harvey had made his discovery, Asellius, an Italian physician, found out the lacteals, or vessels which carry the chyle from the intestines; and printed his account of them, with coloured prints, in the year 1627, the very year before Harvey's book came out.

For a number of years after these two publications, the anatomists in all parts of Europe were daily opening living dogs, either to see the lacteals or to observe the phenomena of the circulation. In making an experiment of this kind, Pecquet in France was fortunate enough to discover the thoracic duct, or common trunk of all the lacteals, which conveys the chyle into the subclavian vein. He printed his discovery in the year 1651. And now the lacteals having been traced from the intestines to the thoracic duct, and that duct having been traced to its termination in a blood-vessel, the passage of the chyle was completely made out.

The same practice of opening living animals furnished occasions of discovering the lymphatic vessels. This good fortune fell to the lot of Rudbec first, a young Swedish anatomist; and then to Thomas Bartholine, a Danish anatomist, who was the first who appeared in print upon the lymphatics. His book came out in the year 1653, that is two years after that of Pecquet. And then it was very evident that they had been seen before by Dr Higmore and others, who had mistaken them for lacteals. But none of the anatomists of those times could make out the origin of the lymphatics, and none of the physiologists could give a satisfactory account of their use.

The circulation of the blood and the passage of the chyle having been satisfactorily traced out in full grown animals, the anatomists were naturally led next to consider how these animal processes were carried on in the child while in the womb of the mother Accordingly the male and female organs, the appearances and contents of the pregnant uterus, the incubated egg, and every

every phenomenon which could illuſtrate generation, became the favourite ſubject for about 30 years with the principal anatomiſts of Europe.

Thus it would appear to have been in theory: but Dr Hunter believes, that in fact, as Harvey's maſter Fabricius laid the foundation for the diſcovery of the circulation of the blood by teaching him the valves of the veins, and thereby inviting him to conſider that ſubject; ſo Fabricius, by his lectures, and by his elegant work *De formato fœtu, et de formatione ovi et pulli*, probably made that likewiſe a favourite ſubject with Dr Harvey. But whether he took up the ſubject of generation in conſequence of his diſcovery of the circulation, or was led to it by his honoured maſter Fabricious, he ſpent a great deal of his time in the inquiry; and publiſhed his obſervations in a book *De generatione animalium*, in the year 1651, that is ſix years before his death.

In a few years after this, Swammerdam, Van Horn, Steno, and De Graaf, excited great attention to the ſubject of generation, by their ſuppoſed diſcovery that the females of viviparous animals have ovaria, that is, cluſters of eggs in their loins, like oviparous animals; which, when impregnated by the male, are conveyed into the uterus: ſo that a child is produced from an egg as well as a chick; with this difference, that one is hatched within, and the other without, the body of the mother.

Malpighi, a great Italian genius, ſome time after, made conſiderable advances upon the ſubject of generation. He had the good fortune to be the firſt who uſed magnifying glaſſes with addreſs in tracing the firſt appearances in the formation of animals. He likewiſe made many other obſervations and improvements in the *minutiæ* of anatomy by his microſcopical labours, and by cultivating comparative anatomy.

This diſtinguiſhed anatomiſt gave the firſt public ſpecimen of his abilities by printing a diſſertation on the lungs *anno* 1661; a period ſo remarkable for the ſtudy of nature, that it would be injuſtice to paſs it without particular notice.

At the ſame time flouriſhed Laurentius Bellinus at Florence, and was the firſt who introduced mathematical reaſoning in phyſic. In 1662, Simon Pauli publiſhed a treatiſe *De albandis oſſibus*. He had long been admired for the white ſkeletons he prepared; and at laſt diſcovered his method, which was by expoſing the bones all winter to the weather.

Johannes Swammerdam of Amſterdam alſo publiſhed ſome anatomical treatiſes; but was moſt remarkable for his knowledge of preſerving the parts of bodies entire for many years, by injecting their veſſels. He alſo publiſhed a treatiſe on reſpiration; wherein he mentioned his having figures of all the parts of the body, as big as the life, cut in copper, which he deſigned to publiſh, with a complete ſyſtem of anatomy. Theſe, however, were never made public by Swammerdam; but, in 1685, Gothofridus Bidloo, profeſſor of anatomy at Leyden, publiſhed a work intitled *Anatomia corporis humani*, where all the parts were delineated in very large plates almoſt as big as the life. Mr Cowper, an Engliſh ſurgeon, bought 300 copies of theſe figures; and in 1698, publiſhed them, with an Engliſh text, quite different from Bidloo's Latin one; to which were added letters in Bidloo's figures, and ſome few figures of Mr Cowper's own. To this work Cowper's name was prefixed, without the leaſt mention of Bidloo, except on purpoſe to confute him. Bidloo immediately publiſhed a very ill-natured pamphlet, called *Gulielmus Cowperus citatus coram tribunali*; appealing to the Royal Society, how far Cowper ought to be puniſhed as a plagiary of the worſt kind, and endeavouring to prove him an ignorant deceitful fellow. Cowper anſwered him in his own ſtyle, in a pamphlet called his *Vindiciæ*; endeavouring to prove, either that Bidloo did not underſtand his own tables, or that they were none of his. It was even alleged that thoſe were the tables promiſed by Swammerdam, and which Bidloo had got from his widow. This, however, appears to have been only an invidious ſurmiſe, there being unqueſtionable evidence that they were really the performance of Bidloo.

Soon after, Iſbrandus Diembroeck, profeſſor of anatomy at Utrecht, began to appear as an author. His work contained very little original; but he was at great pains to collect from others whatever was valuable in their writings, and his ſyſtem was the common ſtandard among anatomical ſtudents for many years.

About the ſame time, Antonius Liewenhoeck of Delft improved conſiderably on Malpighi's uſe of microſcopes. Theſe two authors took up anatomy where others had dropt it; and, by this new art, they brought a number of amazing things to light. They diſcovered the red globules of the blood; they were enabled to ſee the actual circulation of the blood in the tranſparent parts of living animals, and could meaſure the velocity of its motion; they diſcovered that the arteries and veins had no intermediate cells or ſpungy ſubſtance, as Harvey and all the preceding anatomiſts had ſuppoſed, but communicated one with the other by a continuation of the ſame tube.

Liewenhoeck was in great fame likewiſe for his diſcovery of the animalcula in the ſemen. Indeed there was ſcarcely a part of the body, ſolid or fluid, which eſcaped his examination; and he almoſt every where found, that what appeared to the naked eye to be rude undigeſted matter, was in reality a beautiful and regular compound.

After this period, Nuck added to our knowledge of the abſorbent ſyſtem already mentioned, by his injections of the lymphatic glands; Ruyſch, by his deſcription of the valves of the lymphatic veſſels; and Dr Meckel, by his accurate account of the whole ſyſtem, and by tracing thoſe veſſels in many parts where they had not before been deſcribed.

Beſides theſe authors, Drs Hunter and Monro have called the attention of the public to this part of anatomy, in their controverſy concerning the diſcovery of the office of the lymphatics.

When the lymphatic veſſels were firſt ſeen and traced into the thoracic duct, it was natural for anatomiſts to ſuſpect, that as the lacteals abſorbed from the cavity of the inteſtines, the lymphatics, which are ſimilar in figure and ſtructure, might poſſibly do the ſame office with reſpect to other parts of the body: and accordingly, Dr Gliſſon, who wrote in 1654, ſuppoſes theſe veſſels aroſe from cavities, and that their uſe was to abſorb; and Frederic Hoffman has very explicitly laid down the doctrine of the lymphatic veſſels being a ſyſtem of abſorbents. But anatomiſts in general have been of a contrary opinion; for from experiments, par-

ticularly fuch as were made by injections, they have been perfuaded that the lymphatic veffels did not arife from cavities, and did not abforb, but were merely continuations from fmall arteries. The doctrine, therefore, that the lymphatics, like the lacteals, were abforbents, as had been fuggefted by Gliffon and by Hoffman, has been revived by Dr Hunter and Dr Monro, who have controverted the experiments of their predeceffors in anatomy, and have endeavoured to prove that the lymphatic veffels are not continued from arteries, but are abforbents.

To this doctrine, however, feveral objections have been ftarted, particularly by Haller (Elem. Phyf. l. 24. § 2, 3.); and it has been found, that before the doctrine of the lymphatics being a fyftem of abforbents can be eftablifhed, it muft firft be determined whether this fyftem is to be found in other animals befides man and quadrupeds. Mr Hewfon claims the merit of having proved the affirmative of this queftion, by difcovering the lymphatic fyftem in birds, fifh, and amphibious animals. See *Phil. Tranf.* vol. lviii. and lxix.—And latterly, Mr Cruikfhank has traced the ramifications of that fyftem in almoft every part of the body; and from his diffections, figures have been made and lately publifhed to the world. To Mr Sheldon alfo we are much indebted for his illuftration of this fyftem, which promifes to give great fatisfaction, but of which only a part has been yet publifhed.

The gravid uterus is a fubject likewife which has received confiderable improvements, particularly relating to one very important difcovery; viz. that the internal membrane of the uterus, which Dr Hunter has named *decidua*, conftitutes the exterior part of the fecundines or after-birth, and feparates from the reft of the uterus every time that a woman either bears a child or fuffers a mifcarriage. This difcovery includes another, to wit, that the placenta is partly made up of an excrefcence or efflorefcence from the uterus itfelf.

Thefe difcoveries are of the utmoft confequence, both in the phyfiological queftion about the connection between the mother and child, and likewife in explaining the phenomena of births and abortions, as well as in regulating obftetrical practice.

The anatomifts of this century have improved anatomy, and have made the ftudy of it much more eafy, by giving us more correct as well as more numerous figures. It is amazing to think of what has been done in that time. We have had four large folio books of figures of the bones, viz. Chefelden's, Albinus's, Sue's, and Trew's. Of the mufcles, we have had two large folios; one from Cowper, which is elegant; and one from Albinus, which, from the accuracy and labour of the work, we may fuppofe will never be outdone. Of the blood-veffels we have a large folio from Dr Haller. We have had one upon the nerves from Dr Meckel, and another by Dr Monro junior. We have had Albinus's, Roederer's, Jenty's, and Hunter's works upon the pregnant uterus; Weitbrecht and Leber on the joints and frefh bones; Soemerring on the brain; Zinn on the eye; Cotunnius, Mekel junior, &c. on the ear; Walter on the nerves of the thorax and abdomen; Dr Monro on the burfæ mucofæ, &c.

It would be endlefs to mention the anatomical figures that have been publifhed in this century, of particular and fmaller parts of the body, by Morgagni, Ruyfch, Valfalva, Sanctorini, Heifter, Vater, Cant, Zimmerman, Walterus, and others.

Thofe elegant plates of the brain, however, juft publifhed by M. Vicq. d'Azyr, muft not pafs without notice, efpecially as they form part of an univerfal fyftem of anatomy and phyfiology, both human and comparative, propofed to be executed in the fame fplendid ftyle. Upon the brain alone 19 folio plates are employed; of which feveral are coloured. The figures are delineated with accuracy and clearnefs; but the colouring is rather beautiful than correct. Such parts of this work as may be publifhed, cannot fail to be equally acceptable to the anatomift and the philofopher; but the entire defign is apparently too extenfive to be accomplifhed within the period of a fingle life. In our own country, alfo, a very great anatomical work is carrying on by Andrew Bell, F. S. A. S. engraver to his Royal Highnefs the Prince of Wales, with the approbation of Dr Monro, and under the infpection of his very ingenious affiftant Mr Fyfe. It is to compofe a complete illuftration, both general and particular, of the human body, by a felection from the beft plates of all the greateft anatomifts, as well foreign as of this country, exhibiting the lateft difcoveries in the fcience, and accompanied with copious explanations. The whole number of plates mentioned in the Profpectus is 240, of which 152 are already done; all in royal folio.

To the foreign treatifes already mentioned may be added thofe recently publifhed by Sabbatier and Plenck on anatomy in general. Among ourfelves, the writings of Keil, Douglas, Chefelden, the firft Monro, Winflow, &c. are too well known to need defcription. The laft of thefe ufed to be recommended as a ftandard for the ftudents of anatomy: but it has of late given place to a more accurate and comprehenfive fyftem, in three volumes, publifhed by Mr Elliot of Edinburgh, upon a plan approved of by Dr Monro, and executed by Mr Fyfe. Dr Simmons of London has alfo obliged the world with an excellent fyftem of anatomy; and another work, under the title of "Elements of Anatomy and the Animal Œconomy:" in which the fubjects are treated with uncommon elegance and perfpicuity.

In the latter part of the laft century, anatomy made two great fteps, by the invention of injections, and the method of making what we commonly call *preparations*. Thefe two modern arts have really been of infinite ufe to anatomy; and befides have introduced an elegance into our adminiftrations, which in former times could not have been fuppofed to be poffible. They arofe in Holland under Swammerdam and Ruyfch, and afterwards in England under Cowper, St. André, and others, where they have been greatly improved.

The anatomifts of former ages had no other knowledge of the blood-veffels, than what they were able to collect from laborious diffections, and from examining the fmaller branches of them, upon fome lucky occafion, when they were found more than commonly loaded with red blood. But filling the vafcular fyftem with a bright coloured wax, enables us to trace the large veffels with great eafe, renders the fmaller much more confpicuous, and makes thoufands of the very minute ones

ones visible, which from their delicacy, and the transparency of their natural contents, are otherwise imperceptible.

The modern art of corroding the fleshy parts with a menstruum, and of leaving the moulded wax entire, is so exceedingly useful, and at the same time so ornamental, that it does great honour to the ingenious inventor Dr Nicholls.

The wax-work art of the moderns might deserve notice in any history of anatomy, if the masters in that way had not been so careless in their imitation. Many of the wax-figures are so tawdry, with a show of unnatural colours, and so very incorrect in the circumstances of figure, situation, and the like, that though they strike a vulgar eye with admiration, they must appear ridiculous to an anatomist. But those figures which are cast in wax, plaster, or lead, from the real subject, and which of late years have been frequently made here, are, of course, very correct in all the principal parts, and may be considered as no insignificant acquisition to modern anatomy. The proper, or principal use of this art is, to preserve a very perfect likeness of such subjects as we but seldom can meet with, or cannot well preserve in a natural state; a subject in pregnancy, for example.

The modern improved methods of preserving animal bodies, or parts of them, has been of the greatest service to anatomy; especially in saving the time and labour of the anatomist in the nicer dissections of the small parts of the body. For now, whatever he has prepared with care, he can preserve; and the object is ready to be seen at any time. And in the same manner he can preserve anatomical curiosities, or rarities of every kind; such as, parts that are uncommonly formed; parts that are diseased; the parts of the pregnant uterus and its contents. Large collections of such curiosities, which modern anatomists are striving almost everywhere to procure, are of infinite service to the art, especially in the hands of teachers. They give students clear ideas about many things which it is very essential to know, and yet which it is impossible that a teacher should be able to show otherwise, were he ever so well supplied with fresh subjects.

§ 2. *View of the Subject in general, and Plan of the following Treatise.*

THE etymology of the word *anatomy*, as above given, implies simply *dissection;* but by this term something more is usually understood.

It is every day made use of to express a knowledge of the human body; and a person who is said to understand anatomy, is supposed to be conversant with the structure and arrangement of the different solid parts of the body.

It is commonly divided into *Anatomy*, properly so called; and *Comparative* Anatomy: the first of these is confined solely to the human body; the latter includes all animals, so far as a knowledge of their structure may tend to perfect our ideas of the human body. See COMPARATIVE *Anatomy.*

The term *anatomy* may also have another and more extensive signification: it may be employed to express not only a knowledge of the structure and disposition of the parts, but likewise of their œconomy and use. Considered in this light, it will seldom fail to excite the curiosity of people of taste, as a branch of philosophy; since, if it is pleasing to be acquainted with the structure of the body, it is certainly more so to discover all the springs which give life and motion to the machine, and to observe the admirable mechanism by which so many different functions are executed.

Astronomy and anatomy, as Dr Hunter, after Fontenelle, observes, are the studies which present us with the most striking view of the two greatest attributes of the Supreme Being. The first of these fills the mind with the idea of his immensity, in the largeness, distances, and number of the heavenly bodies; the last, astonishes with his intelligence and art in the variety and delicacy of animal mechanism.

The human body has been commonly enough known by the name of *microcosmus*, or the little world; as if it did not differ so much from the universal system of nature in the symmetry and number of its parts as in their size.

Galen's excellent treatise *De usu partium*, was composed as a prose hymn to the Creator; and abounds with as irresistible proofs of a supreme Cause and governing Providence, as we find in modern physico-theology. And Cicero dwells more on the structure and œconomy of animals than on all the productions of nature besides, when he wants to prove the existence of the gods from the order and beauty of the universe. He there takes a survey of the body of man in a most elegant synopsis of anatomy, and concludes thus: "Quibus rebus expositis, satis docuisse videor, hominis natura, quanto omnes anteiret animantes. Ex quo debet intelligi, nec figuram situmque membrorum, nec ingenii mentisque vim talem effici potuisse fortuna."

The satisfaction of mind which arises from the study of anatomy, and the influence which it must naturally have upon our minds as philosophers, cannot be better conveyed than by the following passage from the same author: "Quæ contuens animus, accepit ab his cognitionem deorum, ex qua oritur pietas: cui conjuncta justitia est, reliquæque virtutes: ex quibus vita beata exsistit, par et similis deorum, nulla alia re nisi immortalitate, quæ nihil ad bene vivendum pertinet, cedens cœlestibus."

It would be endless to quote the animated passages of this sort which are to be found in the physicians, philosophers, and theologists, who have considered the structure and functions of animals with a view towards the Creator. It is a view which must strike one with a most awful conviction. Who can know and consider the thousand evident proofs of the astonishing art of the Creator, in forming and sustaining an animal body such as ours, without feeling the most pleasant enthusiasm? Can we seriously reflect upon this awful subject, without being almost lost in adoration? without longing for another life after this, in which we may be gratified with the highest enjoyment, which our faculties and nature seem capable of, the seeing and comprehending the whole plan of the Creator, in forming the universe, and in directing all its operations?

But the more immediate purposes of anatomy concern those who are to be the guardians of health, as this study is necessary to lay a foundation for all the branches of medicine.—The more we know of our fabric, the more reason we have to believe, that if our senses were more acute, and our judgment more enlar-

ged, we ſhould be able to trace many ſprings of life which are now hidden from us: by the ſame ſagacity we ſhould diſcover the true cauſes and nature of diſeaſes; and thereby be enabled to reſtore the health of many, who are now, from our more confined knowledge, ſaid to labour under incurable diſorders. By ſuch an intimate acquaintance with the œconomy of our bodies, we ſhould diſcover even the ſeeds of diſeaſes, and deſtroy them before they had taken root in the conſtitution.

That anatomy is the very baſis of ſurgery every body allows. It is diſſection alone that can teach us, where we may cut the living body with freedom and diſpatch; and where we may venture with great circumſpection and delicacy; and where we muſt not, upon any account, attempt it. This informs the *head*, gives dexterity to the *hand*, and familiarizes the *heart* with a ſort of neceſſary inhumanity, the uſe of cutting-inſtruments upon our fellow-creatures.

Beſides the knowledge of our body, through all the variety of its *ſtructure* and *operations* in a *ſound* ſtate, it is by anatomy only that we can arrive at the knowledge of the true nature of moſt of the diſeaſes which afflict humanity. The ſymptoms of many diſorders are often equivocal; and diſeaſes themſelves are thence frequently miſtaken, even by ſenſible, experienced, and attentive phyſicians. But by anatomical examination after death, we can with certainty find out the miſtake, and learn to avoid it in any ſimilar caſe.

This uſe of anatomy has been ſo generally adopted by the moderns, that the caſes already publiſhed are almoſt innumerable: Mangetus, Morgagni, indeed many of the beſt modern writings in phyſic, are full of them. And if we look among the phyſicians of the beſt character, and obſerve thoſe who have the *art* itſelf, rather than the *craft* of the profeſſion at heart; we ſhall find them conſtantly taking pains to procure leave to examine the bodies of their patients after death.

After having conſidered the riſe and progreſs of anatomy; the various diſcoveries that have been made in it, from time to time; the great number of diligent obſervers who have applied themſelves to this art; and the importance of the ſtudy, not only for the prevention and cure of diſeaſes, but in furniſhing the livelieſt proofs of divine wiſdom; the following queſtions ſeem naturally to ariſe: For what purpoſe is there ſuch a variety of parts in the human body? Why ſuch a complication of nice and tender machinery? Why was there not rather a more ſimple, leſs delicate, and leſs expenſive frame (A)?

In order to acquire a ſatisfactory general idea of this ſubject, and find a ſolution of all ſuch queſtions, let us, in our imagination, *make* a man: in other words, let us ſuppoſe that the *mind*, or immaterial part, is to be placed in a corporeal fabric, in order to hold a correſpondence with other material beings by the intervention of the body; and then conſider, *a priori*, what will be wanted for her accommodation. In this inquiry, we ſhall plainly ſee the neceſſity or advantage, and therefore the final cauſe, of moſt of the parts which we actually find in the human body. And if we conſider that, in order to anſwer ſome of the requiſites, human wit and invention would be very inſufficient; we need not be ſurpriſed if we meet with ſome parts of the body whoſe uſe we cannot yet perceive, and with ſome operations or functions which we cannot explain. We can ſee that the whole bears the moſt ſtriking characters of excelling wiſdom and ingenuity: but the imperfect ſenſes and capacity of *man* cannot pretend to reach every part of a machine, which nothing leſs than the intelligence and power of the *Supreme Being* could contrive and execute.

Firſt, then, the *mind*, the thinking, immaterial agent, muſt be provided with a place of immediate reſidence, which ſhall have all the requiſites for the union of ſpirit and body; accordingly ſhe is provided with the *brain*, where ſhe dwells as governor and ſuperintendant of the whole fabric.

In the next place, as ſhe is to hold a correſpondence with all the material beings around her, ſhe muſt be ſupplied with organs fitted to receive the different kinds of impreſſions which they will make. In fact, therefore, we ſee that ſhe is provided with the organs of ſenſe, as we call them: the eye is adapted to light; the ear to ſound; the noſe to ſmell; the mouth to taſte; and the ſkin to touch.

Further: She muſt be furniſhed with organs of communication between herſelf in the brain and thoſe organs of ſenſe, to give her information of all the impreſſions that are made upon them: and ſhe muſt have organs between herſelf in the brain and every other part of the body, fitted to convey her commands and influence over the whole. For theſe purpoſes the nerves are actually given. They are chords, which riſe from the brain, the immediate reſidence of the mind, and diſperſe themſelves in branches through all parts of the body. They convey all the different kinds of ſenſations to the mind, in the brain; and likewiſe carry out from thence all her commands or influence to the other parts of the body. They are intended to be occaſional monitors againſt all ſuch impreſſions as might endanger the well-being of the whole, or of any particular part; which vindicates the Creator of all things, in having actually ſubjected us to thoſe many diſagreeable and painful ſenſations which we are expoſed to from a thouſand accidents in life.

Moreover, the mind, in this corporeal ſyſtem, muſt be endued with the power of moving from place to place, that ſhe may have intercourſe with a variety of objects; that ſhe may fly from ſuch as are diſagreeable, dangerous, or hurtful, and purſue ſuch as are pleaſant or uſeful to her. And accordingly ſhe is furniſhed with limbs, and with muſcles and tendons, the inſtruments of motion, which are found in every part of the fabric where motion is neceſſary.

But to ſupport, to give firmneſs and ſhape to the fabric; to keep the ſofter parts in their proper places; to give fixed points for, and the proper direction to its motions, as well as to protect ſome of the more important and tender organs from external injuries; there

(A) The following beautiful repreſentation is taken from the late Dr Hunter's *Introductory Lecture in Anatomy*.

there muft be fome firm prop-work interwoven through the whole. And in fact, for fuch purpofes the bones are given.

The prop-work muft not be made into one rigid fabric, for that would prevent motion. Therefore there are a number of bones.

Thefe pieces muft all be firmly bound together, to prevent their diflocation. And this end is perfectly well anfwered by the ligaments.

The extremities of thefe bony pieces, where they move and rub upon one another, muft have fmooth and flippery furfaces for eafy motion. This is moft happily provided for, by the cartilages and mucus of the joints.

The interftices of all thefe parts muft be filled up with fome foft and ductile matter, which fhall keep them in their places, unite them, and at the fame time allow them to move a little upon one another. And thefe purpofes are anfwered by the cellular membrane or adipofe fubftance.

There muft be an outward covering over the whole apparatus, both to give it compactnefs and to defend it from a thoufand injuries; which, in fact, are the very purpofes of the fkin and other integuments.

Laftly, The mind being formed for fociety and intercourfe with beings of her own kind, fhe muft be endued with powers of expreffing and communicating her thoughts by fome fenfible marks or figns; which fhall be both eafy to herfelf, and admit of great variety: and accordingly fhe is provided with the organs and faculty of fpeech, by which fhe can throw out figns with amazing facility, and vary them without end.

Thus we have built up an animal body which would feem to be pretty complete: but as it is the nature of matter to be altered and worked upon by matter; fo in a very little time fuch a living creature muft be deftroyed, if there is no provifion for repairing the injuries which fhe muft commit upon herfelf, and thofe which fhe muft be expofed to from without. Therefore a treafure of blood is actually provided in the heart and vafcular fyftem, full of nutritious and healing particles, fluid enough to penetrate into the minuteft parts of the animal; impelled by the heart, and conveyed by the arteries, it wafhes every part, builds up what was broken down, and fweeps away the old and ufelefs materials. Hence we fee the neceffity or advantage of the heart and arterial fyftem.

What more there was of this blood than enough to repair the prefent damages of the machine, muft not be loft, but fhould be returned again to the heart; and for this purpofe the venous fyftem is actually provided. Thefe requifites in the animal explain, *a priori*, the circulation of the blood.

The old materials which were become ufelefs, and are fwept off by the current of blood, muft be feparated and thrown out of the fyftem. Therefore glands, the organs of Secretion, are given for ftraining whatever is redundant, vapid, or noxious, from the mafs of blood; and when ftrained, they are thrown out by emunctories, called organs of Excretion.

But now, as the machine muft be conftantly wearing, the reparation muft be carried on without intermiffion, and the ftrainers muft always be employed. Therefore there is actually a perpetual circulation of the blood, and the fecretions are always going on.

Even all this provifion, however, would not be fufficient; for that ftore of blood would foon be confumed, and the fabric would break down, if there were not a provifion made for frefh fupplies. Thefe we obferve, in fact, are profufely fcattered round her in the animal and vegetable kingdoms; and fhe is furnifhed with hands, the fitteft inftruments that could have been contrived, for gathering them, and for preparing them in a variety of ways for the mouth.

But thefe fupplies, which we call food, muft be confiderably changed; they muft be converted into blood. Therefore fhe is provided with teeth for cutting and bruifing the food, and with a ftomach for melting it down: In fhort, with all the organs fubfervient to digeftion.—The finer parts of the aliments only can be ufeful in the conftitution: thefe muft be taken up and conveyed into the blood, and the dregs muft be thrown off. With this view the inteftinal canal is actually given. It feparates the nutritious part, which we call *chyle*, to be conveyed into the blood by the fyftem of abforbent veffels; and the feces pafs downwards, to be conducted out of the body.

Now we have got our animal not only furnifhed with what is wanted for its immediate exiftence, but alfo with the powers of protracting that exiftence to an indefinite length of time. But its duration, we may prefume, muft neceffarily be limited: for as it is nourifhed, grows, and is raifed up to its full ftrength and utmoft perfection; fo it muft in time, in common with all material beings, begin to decay, and then hurry on to final ruin. Hence we fee the neceffity of a fcheme for renovation. Accordingly wife Providence, to perpetuate, as well as preferve his work, befides giving a ftrong appetite for life and felf-prefervation, has made animals male and female, and given them fuch organs and paffions as will fecure the propagation of the fpecies to the end of time.

Thus we fee, that by the very imperfect furvey which human reafon is able to take of this fubject, the animal man muft neceffarily be complex in his corporeal fyftem, and in its operations.

He muft have one great and general fyftem, the vafcular, branching through the whole for circulation: Another, the nervous, with its appendages the organs of fenfe, for every kind of feeling: And a third, for the union and connection of all thofe parts.

Befides thefe primary and general fyftems, he requires others which may be more local or confined: One for ftrength, fupport, and protection; the bony compages: Another for the requifite motions of the parts among themfelves, as well as for moving from place to place; the mufcular part of the body: Another to prepare nourifhment for the daily recruit of the body; the digeftive organs: And one for propagating the fpecies; the organs of generation.

And in taking this general furvey of what would appear, *a priori*, to be neceffary for adapting an animal to the fituations of life, we obferve, with great fatisfaction, that man is accordingly made of fuch fyftems, and for fuch purpofes. He has them all; and he has nothing more except the organs of refpiration. Breathing it feemed difficult to account for *a priori*: we only knew it to be in fact effentially and neceffary to life. Notwithftanding this, when we faw all the other parts of the body, and their functions, fo well ac-

counted for, and so wisely adapted to their several purposes, there could be no doubt that respiration was so likewise: And accordingly, the discoveries of Dr Priestley have lately thrown light upon this function also, as will be shown in its proper place.

Of all the different systems in the human body, the use and necessity are not more apparent, than the wisdom and contrivance which has been exerted in putting them all into the most compact and convenient form: in disposing them so, that they shall mutually receive, and give helps to one another; and that all, or many of the parts, shall not only answer their principal end or purpose, but operate successfully and usefully in a variety of secondary ways.

If we consider the whole animal machine in this light, and compare it with any machine in which human art has exerted its utmost; suppose the best constructed ship that ever was built, we shall be convinced beyond the possibility of doubt, that there are intelligence and power far surpassing what humanity can boast of.

One superiority in the natural machine is peculiarly striking.—In machines of human contrivance or art, there is no internal power, no principle in the machine itself, by which it can alter and accommodate itself to any injury which it may suffer, or make up any injury which admits of repair. But in the natural machine, the animal body, this is most wonderfully provided for, by internal powers in the machine itself; many of which are not more certain and obvious in their effects, than they are above all human comprehension as to the manner and means of their operation. Thus, a wound heals up of itself; a broken bone is made firm again by a callus; a dead part is separated and thrown off; noxious juices are driven out by some of the emunctories; a redundancy is removed by some spontaneous bleeding; a bleeding naturally stops of itself; and a great loss of blood, from any cause, is in some measure compensated, by a contracting power in the vascular system, which accommodates the capacity of the vessels to the quantity contained. The stomach gives information when the supplies have been expended; represents, with great exactness, the quantity and the quality of what is wanted in the present state of the machine; and in proportion as she meets with neglect, rises in her demand, urges her petition in a louder tone, and with more forcible arguments. For its protection, an animal body resists heat and cold in a very wonderful manner, and preserves an equal temperature in a burning and in a freezing atmosphere.

A farther excellence or superiority in the natural machine, if possible, still more astonishing, more beyond all human comprehension, than what we have been speaking of, is the following. Besides those internal powers of self-preservation in each individual, when two of them co-operate, or act in concert, they are endued with powers of making other animals or machines like themselves, which again are possessed of the same powers of producing others, and so of multiplying the species without end.

These are powers which mock all human invention or imitation. They are characteristics of the divine Architect.

Having premised this general account of the subject, we shall next consider the method to be observed in treating it.

The study of the *human* body, as already noticed, is commonly divided into two parts. The first, which is called *Anatomy*, relates to the matter and structure of its parts; the second, called *Physiology* and *Animal œconomy*, relates to the principles and laws of its internal operations and functions.

As the body is a compound of solids and fluids, *Anatomy* is divided into,

1. The Anatomy of the solids, and
2. The Anatomy of the fluids.

I. The SOLIDS, by which we mean all parts of our body, which are not fluid, are generally divided into two classes, viz.

1. The hard solids or bones. This part of anatomy is called *Osteology;* which signifies the doctrine of the bones.

2. The softer solids; which part is called *Sarcology*, viz. the doctrine of flesh.

This division of the solids, we may observe, has probably taken its origin from the vulgar observation, that the body is made of bone and flesh. And as there are many different kinds of what are called soft or fleshy parts, Sarcology is subdivided into,

(1.) *Angeiology*, or the doctrine of vessels; by which is commonly understood *blood-vessels*:

(2.) *Adenology*, of glands:

(3.) *Neurology*, of nerves:

(4.) *Myology*, of muscles: and,

(5.) *Splanchnology*, of the viscera or bowels. There is, besides, that part which treats of the organs of sense and of the integuments.

This division of the solids has been here mentioned, rather for the sake of explaining so many words, which are constantly used by anatomists, than for its importance or accuracy. For besides many other objections that might be urged, there are in the body three species of solids, viz. gristle or cartilage, hair, and nails; which are of an intermediate nature between bone and flesh; and therefore cannot so properly be brought into the osteology or the sarcology. The cartilages were classed with the bones; because the greatest number of them are appendages to bones: and for the like reason the hair and the nails were classed with the integuments.

II. The FLUIDS of the human body may be divided into *three* kinds, which Dr Hunter calls the *crude*, the *general* or *perfect*, and the *local* or *secreted fluid.*

1. By the *crude* fluid is meant the chyle, and whatever is absorbed at the surfaces of the body; in other words, what is recently taken into the body, and is not yet mixed with or converted into blood.

2. The *general* or *perfect* fluid is the blood itself; to wit, what is contained in the heart, arteries, and veins, and is going on in the round of the circulation.

3. The *local* or *secreted*, are those fluids peculiar to particular parts of the body, which are strained off from the blood, and yet are very different in their properties from the blood. They are commonly called *secretions;* and some are useful, others excrementitious.

In treating of the *Physiology*, it is very difficult to say what plan should be followed; for every method which has been yet proposed, is attended with manifest inconvenience.

convenience. The powers and operations of the machine have ſuch a dependence upon one another, ſuch connections and reciprocal influence, that they cannot well be underſtood or explained ſeparately. In this ſenſe our body may be compared to a circular chain of powers, in which nothing is firſt or laſt, nothing ſolitary or independent; ſo that wherever we begin, we find that there is ſomething preceding which we ought to have known. If we begin with the brain and the nerves, for example, we ſhall find that theſe cannot exiſt, even in idea, without the heart: if we ſet out with the heart and vaſcular ſyſtem, we ſhall preſently be ſenſible, that the brain and nerves muſt be ſuppoſed: or, ſhould we take up the mouth, and follow the courſe of the aliment, we ſhould ſee that the very firſt organ which preſented itſelf, ſuppoſed the exiſtence both of the heart and brain: Wherefore we ſhall incorporate the Phyſiology with the Anatomy, by attempting to explain the functions after we have demonſtrated the organs.

PART I. OSTEOLOGY.

WE begin with the bones, which may be conſidered as the great ſupport of the body, tending to give it ſhape and firmneſs.—But before we enter into the detail of each particular bone, it will be neceſſary to deſcribe their compoſition and connections, and to explain the nature of the different parts which have an immediate relation to them; as the cartilages, ligaments, perioſteum, marrow, and ſynovial glands.

SECT. I. *Of the Bones in general, with their Appendages*, &c.

1 Of the compoſition of the bones. THE bones are of a firm and hard (B) ſubſtance, of a white colour, and perfectly inſenſible. They are the moſt compact and ſolid parts of the body, and ſerve for the attachment or ſupport of all the other parts.

Three different ſubſtances are uſually diſtinguiſhed in them; their exterior or bony part, properly ſo called; their ſpongy cells; and their reticular ſubſtance. The firſt of theſe is formed of many laminæ or plates, compoſing a firm hard ſubſtance—The ſpongy or cellular part is ſo called on account of its reſemblance to a ſponge, from the little cells which compoſe it. This ſubſtance forms almoſt the whole of the extremities of cylindrical bones. The reticular part is compoſed of fibres, which croſs each other in different directions. This net-work forms the internal ſurface of thoſe bones which have cavities.

The flat bones, as thoſe of the head, are compoſed only of the laminæ and the cellular ſubſtance. This laſt is uſually found in the middle of the bone dividing it into two plates, and is there called *diploë*.

Gagliardi, who pretended to have diſcovered an infinite number of claviculi (C), or bony proceſſes, which he deſcribes as traverſing the laminæ to unite them together, has endeavoured to ſupport this pretended diſcovery by the analogy of bones to the bark of trees, in which certain woody nails have been remarked; but this opinion ſeems to be altogether fanciful.

Some writers have ſuppoſed, that the bones are formed by layers of the perioſteum, which gradually oſſify, in the ſame manner as the timber is formed in trees by the hardening of the white ſubſtance that is found between the inner bark and the wood. M. Duhamel, who has adopted this opinion, fed different animals with madder and their ordinary food alternately during a certain time; and he aſſerts, that in diſſecting their bones, he conſtantly obſerved diſtinct layers of red and white, which correſponded with the length of time they had lived on madder or their uſual aliment. But it has ſince been proved by Detleff, that M. Duhamel's experiments were inaccurate, and that neither the perioſteum nor the cartilages are tinged by the uſe of madder, which is known to affect the bones only.

We uſually conſider in a bone, its body and its extremities. The ancients gave the name of diaphyſis to the body or middle part, and divided the extremities into apophyſis and epiphyſis. An apophyſis, or proceſs, as it is more commonly called, is an eminence continued from the body of the bone, whereas an epiphyſis is at firſt a ſort of an appendage to the bone, by means of an intermediate cartilage. Many epiphyſes, which appear as diſtinct bones in the fœtus, afterwards become apophyſes; for they are at length ſo completely united to the body of the bone as not to be diſtinguiſhable from it in the adult ſtate. It is not unuſual, however, at the age of 18 and even 20 years, to find the extremities of bones ſtill in the ſtate of epiphyſis.

The names given to the proceſſes of bones are expreſſive of their ſhape, ſize, or uſe; thus if a proceſs is large and of a ſpherical form, it is called *caput*, or *head;* if the head is flatted, it is termed *condyle*. Some proceſſes, from their reſemblance to a ſtiletto, a breaſt, or the beak of a crow, are called *ſtyloid, maſtoid*, or *coracoid:* others are ſtyled *ridges* or *ſpines*. The two proceſſes of the os femoris derive their name of *trochanters* from their uſe.

A bone has its cavities as well as proceſſes. Theſe cavities either extend quite through its ſubſtance, or appear only as depreſſions. The former are called *foramina* or *holes*, and theſe foramina are ſometimes termed *canals* or *conduits*, according to their form and extent. Of the depreſſions, ſome are uſeful in articulation. Theſe are called *cotyloid* when they are deep, as is the caſe with the os innominatum, where it receives the head of the os femoris; or *glenoid* when they are ſuperficial, as in the ſcapula, where it receives the os humeri. Of the depreſſions that are not deſigned for

(B) Mr Scheele has lately diſcovered that bones contain the phoſphoric acid united with calcareous earth; and that to this combination they owe their firmneſs.

(C) In his *Anat. oſſium nov. invent. illuſtrat.* he deſcribes four kinds of theſe claviculi or nails, viz. the perpendicular, oblique, headed, and crooked.

for articulation, thoſe which have ſmall apertures are called *ſinuſes*; others that are large, and not equally ſurrounded by high brims, are ſtyled *foſſæ*; ſuch as are long and narrow, *furrows*; or if broad and ſuperficial without brims, *ſinuoſities*. Some are called *digital impreſſions*, from their reſemblance to the traces of a finger on ſoft bodies.

2 Connection of the bones.

We ſhall abridge this article, which is exceedingly diffuſe in the generality of anatomical books, and will endeavour to deſcribe it with all the clearneſs it will allow.

The bones compoſing the ſkeleton are ſo conſtructed, that the end of every bone is perfectly adapted to the extremity of that with which it is connected, and this connection forms what is called their *articulation*.

Articulation is divided into *diarthroſis*, *ſynarthroſis*, and *amphiarthroſis*, or moveable, immoveable, and mixed articulation. Each of the two firſt has its ſubdiviſions. Thus the *Diarthroſis*, or moveable articulation, includes, 1. the enarthroſis, as it is called, when a large head is admitted into a deep cavity, as in the articulation of the os femoris with the os innominatum. 2. Arthrodia, when a round head is articulated with a ſuperficial cavity, as is the caſe of the os humeri and ſcapula, 3. Ginglimus, or hinge-like articulation, as in the connection of the thigh-bone with the tibia. The enarthroſis and arthrodia allow of motion to all ſides; the ginglimus only of flexion and extenſion.

The *ſynarthroſis*, or immoveable articulation, includes, 1. The ſuture, when the two bones are indented into each other, as is the caſe with the parietal bones. 2. Gomphoſis, when one bone is fixed into another, in the manner the teeth are placed in their ſockets.

The term *amphiarthroſis* is applied to thoſe articulations which partake both of the ſynarthroſis and diarthroſis, as is the caſe with the bones of the vertebræ, which are capable of motion in a certain degree, although they are firmly connected together by intermediate cartilages.

What is called *ſymphyſis* is the union of two bones into one; as in the lower jaw, for inſtance, which in the fœtus conſiſts of two diſtinct bones, but becomes one in a more advanced age, by the oſſification of the uniting cartilage.

When bones are thus joined by the means of cartilages, the union is ſtyled *ſynchondroſis*; when by ligaments, *ſyneuroſis*.

3 Of the Cartilages.

Cartilages are white, ſolid, ſmooth, and elaſtic ſubſtances, between the hardneſs of bones and ligaments, and ſeemingly of a fibrous texture. We are not able to trace any veſſels into their ſubſtance by injection, nor are they ever found tinged in animals that have been fed with madder.

They may be diſtinguiſhed into, 1ſt, Thoſe which are connected with the bones; and, 2dly, Thoſe which belong to other parts of the body. The firſt ſerve either to cover the ends and cavities of bones intended for motion, as in the articulations, where by their ſmoothneſs they facilitate motions, which the bones alone could not execute with ſo much freedom; or they ſerve to unite bones together, as in the ſymphyſis pubis, or to lengthen them as in the ribs.

Many of them oſſifying as we advance in life, their number is leſs in the adult than in the fœtus, and of courſe there are fewer bones in the old than in the young ſubject.

Of the ſecond claſs of cartilages, or thoſe belonging to the ſoft parts, we have inſtances in the larynx, where we find them uſeful in the formation of the voice, and for the attachment of muſcles.

4 Of the Perioſteum.

The perioſteum is a fine membrane of a compact cellular texture, reflected from one joint to another, and ſerving as a common covering to the bones. It has ſanguiferous and lymphatic veſſels, and is ſupplied with nerves from the neighbouring parts. It adheres very firmly to their ſurface, and by its ſmoothneſs facilitates the motion of muſcles. It likewiſe ſupports the veſſels that go to be diſtributed through the ſubſtance of the bones, and may ſerve to ſtrengthen the articulations. At the extremities of bones, where it is found covering a cartilage, it has by ſome been improperly conſidered as a diſtinct membrane, and named *perichondrium*. This, in its uſe and ſtructure, reſembles the perioſteum. Where it covers the bones of the ſkull, it has gotten the name of *pericranium*.

The perioſteum is not a production of the dura mater, as the ancients, and after them Havers, imagined; nor are the bones formed by the oſſification of this membrane, at leaſt when it is in a ſound ſtate, as ſome late writers have ſuppoſed.

The perioſteum is deficient in the teeth above the ſockets, and in thoſe parts of bones to which ligaments or tendons are attached.

5 Of the Marrow.

The marrow is a fat oily ſubſtance, filling the cavities of bones. In the great cavities of long bones it is of a much firmer conſiſtence than in the cells of their ſpongy part. In the former it inclines ſomewhat to a yellowiſh tinge, and is of the conſiſtence of fat; in the latter it is more fluid, and of a red colour. This difference in colour and conſiſtence is owing to accidental cauſes; both kinds are of the ſame nature, and may both be deſcribed under the common name of marrow, though ſome writers give this name only to the fat-like ſubſtance, and call the other the medullary juice.

The marrow is contained in a very fine and tranſparent membrane, which is ſupplied with a great number of blood-veſſels, chiefly from the perioſteum. This membrana medullaris adheres to the inner ſurface of the bones, and furniſhes an infinite number of minute bags or veſicles for incloſing the marrow, which is likewiſe ſupported in the cavities of the bones by the long filaments of their reticular ſubſtance.

Beſides the veſſels from the perioſteum, the membrana medullaris is furniſhed with others, which in the long bones may be ſeen paſſing in near the extremities of the bone, and ſending off numerous branches that ramify through all the veſicles of this membrane.

The bones, and the cells containing the marrow, are likewiſe furniſhed with lymphatics. By their means, the marrow, like the fat, may be taken up in a greater quantity than it is ſecreted; and hence it is that ſo little is found in the bones of thoſe who die of lingering diſeaſes.

It is ſtill a matter of controverſy, Whether the marrow is ſenſible or not? We are certainly not able to trace any nerves to it; and from this circumſtance, and its analogy to fat, Haller has ventured to conſider it as inſenſible. On the other hand, Duverney aſſerts, that

Osteology. that an injury done to this substance in a living animal was attended with great pain. In this dispute physiologists do not seem to have sufficiently discriminated between the marrow itself and the membranous cells in which it is contained. The former, like the fat, being nothing more than a secreted, and of course an inorganized matter, may with propriety be ranked among the insensible parts, as much as inspissated mucus or any other secreted matter in the body; whereas the membrana medullaris being vascular, though it possesses but an obscure degree of feeling in a sound state, is not perfectly insensible.

The marrow was formerly supposed to be intended for the nourishment and renewal of the bones; but this doctrine is now pretty generally and deservedly exploded. It seems probable that the marrow is to the bones what fat is to the soft parts. They both serve for some important purposes in the animal œconomy; but their particular use has never yet been clearly ascertained. The marrow, from the transudation of the oil through the bones of a skeleton, is supposed to diminish their brittleness; and Havers, who has written professedly on the bones, describes the canals by which the marrow is conveyed through every part of their substance, and divides them into longitudinal and transverse ones. He speaks of the first as extending through the whole length of the bone; and of the latter, as the passages by which the longitudinal ones communicate with each other. The similarity of these to the large cancelli in burnt bones, and the transudation of the oil through the bones of the skeleton, seems to prove that some such passages do actually exist.

6 Synovial glands.

The synovial glands are small bodies (D), supposed to be of a glandular structure, and exceedingly vascular, secreting a fluid of a clear mucilaginous nature, which serves to lubricate the joints. They are placed in small cavities in the articulations, so as to be capable of being gently compressed by the motion of the joint, which expresses their juice in proportion to the degree of friction. When the synovia is wanting, or is of too thick a consistence, the joint becomes stiff and incapable of flexion or extension. This is what is termed *anchylosis*.

7 Of the Ligaments.

Ligaments are white, glistening, inelastic bands, of a compact substance, more or less broad or thick, and serving to connect the bones together. They are distinguished by different names adapted to their different forms and uses. Those of the joints are called either round or bursal. The round ligaments are white, tendinous, and inelastic. They are strong and flexible, and are found only in the joint of the knee, and in the articulation of the os femoris with the os innominatum. The bursal, or capsular ligaments, surround the whole joint like a purse, and are to be found in the articulations which allow motion every way, as in the articulation of the arm with the scapula.

8 Of the Bursæ mucosæ.

Of those sacs called *Bursæ mucosæ*, a few were known to former anatomists, but by much the greater number have been since discovered by Dr Monro (E), who observes, that they are to be met with in the extremities of the body only; that many of them are placed entirely on the inner sides of the tendons, between these and the bones. Many others cover not only the inner, but the outer sides of the tendons, or are interposed between the tendons and external parts, as well as between those and the bones.

Some are situated between the tendons and external parts only or chiefly, some between contiguous tendons, or between the tendons or the ligaments and the joints. A few such sacs are observed where the processes of bones play upon the ligaments, or where one bone plays upon another. Where two or more tendons are contiguous, and afterwards separate from each other, we generally find a common bursa divided into branches, with which it communicates; and a few bursæ of contiguous tendons communicate with each other.— Some, in healthy children, communicate with the cavities of the joints; and in many old people he has seen such communications formed by use or worn by friction, independent of disease.

Their proper membrane is thin and transparent, but very dense, and capable of confining air or any other fluid. It is joined to the neighbouring parts by the common cellular substance. Between the bursa and the hard substance of bone a thin layer of cartilage or of tough membrane is very generally interposed. To the cellular substance on the outside of the bursa, the adipose substance is connected; except where the bursa covers a tendon, cartilage, or bone, much exposed to pressure or friction.

In several places a mass of fat, covered with the continuation of the membrane of the bursa, projects into its cavity. The edges of this are divided into fringes.

The inner side of the membrane is smooth, and is extremely slippery from the liquor secreted in it.

9 Their structure compared with that of the capsular ligaments of the joints.

The structure of the bursæ bears a strong resemblance to the capsular ligaments of the joints. 1. The inner layer of the ligament, like that of the bursæ, is thin and dense. 2. It is connected to the external ligaments by the common cellular substance. 3. Between it and the bones, layers of cartilage, or the articular cartilages, are interposed. 4. At the sides of the joints, where it is not subjected to violent pressure and friction, the adipose substance is connected with the cellular membrane. 5. Within the cavities of the joints we observe masses of fat projecting, covered with similar blood-vessels, and with similar fimbriæ hanging from their edges. 6. In the knee the upper part of such a mass of fat forms what has been called the *mucilaginous gland of the joint*, and the under part projects into the bursa behind the ligament which ties the patella to the tibia. 7. The liquor which lubricates the bursæ has the same colour, consistence, and properties as that of the joints, and both are affected in the same manner by heat, mineral acids, and ardent spirits. 8. In some places the bursæ constantly communicate with the cavities of the joints, in others they generally do so; from which we may infer a sameness of structure.

When we examine the fimbriæ common to the fatty bodies of the joints and bursæ, and which have been supposed to be the ducts of glands lodged within the masses

(D) It is now much doubted, however, whether the appearances in the joints, which are usually called *glands*, are any thing more than assemblages of fat.

(E) See *Description of the Bursæ Mucosæ*, &c.

Osteology. masses of fat, we are not able to discover any glandular appearance within them. And although we observe many vessels dispersed upon the membranes of the fatty bodies and fimbriæ; and that we cannot doubt that these fimbriæ consist of ducts which contain a lubricating liquor, and can even press such a liquor from them; yet their cavities and orifices are so minute, that they are not discoverable even by the assistance of magnifying-glasses. These fimbriæ appear, therefore, to be ducts like those of the urethra, which prepare a mucilaginous liquor without the assistance of any knotty or glandular organ.

Upon the whole, the synovia seems to be furnished by invisible exhalent arteries by the ducts of the fimbriæ, and by oil exsuding from the adipose follicles by passages not yet discovered.

10 Of the Skeleton. The word *skeleton*, which by its etymology implies simply a dry preparation, is usually applied to an assemblage of all the bones of an animal united together in their natural order. It is said to be a natural skeleton, when the bones are connected together by their own proper ligaments; and an artificial one, when they are joined by any other substance, as wire, &c.

The skeleton is generally divided into the head, trunk, and extremities. The first division includes the bones of the cranium and face. The bones of the trunk are the spine, ribs, sternum, and bones of the pelvis.

The upper extremity on each side consists of the two bones of the shoulder, viz. the scapula and clavicle; the bone of the arm or os humeri; the bones of the fore-arm, and those of the hand.

The lower extremity on each side of the trunk consists of the thigh-bone and the bones of the leg and foot.

Sect. II. *Of the Bones of the Head.*

The head is of a roundish figure, and somewhat oval (F). Its greatest diameter is from the forehead to the occiput; its upper part is called *vertex*, or crown of the head; its anterior or fore-part the face; and the upper part of this *sinciput*, or forehead; its sides the temples; its posterior, or hind-part, the *occiput;* and its inferior part the *basis*.

The bones of the head may be divided into those of the cranium and face.

§ 1. *Bones of the Cranium and Face.*

There are eight bones of the cranium, viz. the coronal bone, or os frontis; the two parietal bones, or ossa bregmatis; the os occipitis; the two temporal bones; the sphenoid bone; and the os ethmoides, or cribriforme.

11. Of these, only the os occipitis and ossa bregmatis are considered as proper to the cranium; the rest being common both to the cranium and face.

These bones are all harder at their surface than in their middle; and on this account they are divided into two tables, and a middle spongy substance called *diplöe*.

12 Of the Os Frontis. In this, as in all the other bones, we shall consider its figure, structure, processes, depressions, and cavities; and the manner in which it is articulated with the other bones.

The os frontis has some resemblance in shape to the shell of the cockle. Externally it is convex, its concave side being turned towards the brain. This bone, in the places where it is united to the temporal bones, is very thin, and has there no diplöe. It is likewise exceedingly thin in that part of the orbit of the eye which is nearest to the nose. Hence it is, that a wound in the eye, by a sword or any other pointed instrument, is sometimes productive of immediate death. In these cases, the sword passing through the weak part of the bone, penetrates the brain, and divides the nerves at their origin; or perhaps opens some blood-vessel, the consequences of which are soon fatal.

We observe on the exterior surface of this bone five apophyses or processes, which are easily to be distinguished. One of these is placed at the bottom and narrowest part of the bone, and is called the nasal process, from its supporting the upper end of the bones of the nose. The four others are called angular or orbitar processes. They assist to form the orbits, which are the cavities on which the eyes are placed. In each of these orbits there are two processes, one at the interior or great angle, and the other at the exterior or little angle of the orbit. They are called the angular processes. Between these a ridge is extended in form of an arch, and on this the eye-brows are placed. It is called the orbitar or superciliary ridge, and in some measure covers and defends the globe of the eye. There is a hole in this for the passage of the frontal vessels and nerves. This arch is interrupted near the nose by a small pit, in which the tendon of the musculus obliquus major of the eye is fixed. From the under part of each superciliary ridge a thin plate runs a considerable way backwards, and has the name of *orbitar*; the external and fore-part of this plate forms a sinuosity for lodging the lacrymal gland. Between the orbitar plates there is a large discontinuation of the bone, which is filled up by the cribriform part of the os ethmoides.

On examining the inner surface of this bone at its under and middle part, we observe an elevation in form of a ridge, which has been called the *spinous process;* it ascends for some way, dividing the bone into two considerable fossæ, in which the anterior lobes of the brain are placed. To a narrow furrow in this ridge is attached the extremity of the falx, as the membrane is called, which divides the brain into two hemispheres. The furrow becoming gradually wider, is continued to the upper and back part of the bone. It has the falx fixed

(F) The bones of the fœtus being perfectly distinct, and the muscles in young persons not acting much, the shape of the head has been supposed to depend much on the management of children when very young. Vesalius, who has remarked the difference in people of different nations, observes for instance, that the head of a Turk is conical, from the early use of the turban; whilst that of an Englishman is flattened by the chin-stay. Some of the latest physiologists suppose, with good reason, that this difference is chiefly owing to certain natural causes with which we are as yet unacquainted.

Osteology. fixed to it, and part of the longitudinal finus lodged in it. Befides the two foffæ, there are many depreffions, which appear like digital impreffions, and owe their formation to the prominent circumvolutions of the brain.

In the fœtus, the forehead is compofed of two diftinct bones; fo that in them the fagittal future reaches from the os occipitis to the nofe. This bone is almoft every where compofed of two tables and a diploë. Thefe two tables feparating from each other under the eyes, form two cavities, one on each fide of the face, called the frontal finufes. Thefe finufes are lined with a foft membrane, called *membrana pituitaria*. In thefe finufes a mucus is fecreted, which is conftantly paffing through two fmall holes into the noftrils, which it ferves to moiften.

The os frontis is joined by future to many of the bones of the head, viz. to the parietal, maxillary, and temporal bones; to the os ethmoides; os fphenoides; os unguis; and offa nafi. The future which connects it with the parietal bones is called the *coronal future*.

13 Of the parietal bones.

The parietal bones are two in number; they are very thin, and even tranfparent in fome places. The particular figure of each of thefe bones is that of an irregular fquare, bordered with indentations through its whole circumference, except at its lower part. It will be eafily conceived, that thefe bones which compofe the fuperior and lateral parts of the cranium, and cover the greateft part of the brain, form a kind of vault. On their inner furface we obferve the marks of the veffels of the dura mater; and at their upper edge the groove for the fuperior longitudinal finus.

The offa parietalia are joined to each other by the fagittal future; to the os fphenoides and offa temporum by the fquamous future; to the os occipitis by the lambdoidal future (G), fo called from its refemblance to the Greek letter lambda; and to the os frontis by the coronal future.

In the fœtus, the parietal bones are feparated from the middle of the divided os frontis by a portion of the cranium then unoffified.

14 Of the occipital bone.

The occipital bone forms the pofterior and inferior parts of the fkull; it approaches nearly to the fhape of a lozenge, and is indented throughout three parts of its circumference.

There is a confiderable hole in the inferior portion of this bone, called the *foramen magnum*, through which the medulla oblongata paffes into the fpine.—The nervi acceffórii, and vertebral arteries, likewife pafs through it. Behind the condyles are two holes for the paffage of cervical veins into the lateral finufes; and above them are two others for the paffage of the eighth pair and acceffory nerves out of the head. At the fides, and a little on the anterior part of the foramen magnum, are two proceffes, called the condyles, one on each fide; they are of an oval figure, and are covered with cartilage.

The external furface of this bone has a large tranfverfe arched ridge, under which the bone is very irregular, where it affords attachment to feveral mufcles. On examining its inner furface, we may obferve two ridges in form of a crofs; one afcending from near the foramen magnum to the top of the bone; the upper end of this in which the falx is fixed, is hollow, for lodging the fuperior longitudinal finus, and the under end has the third procefs of the dura mater fixed to it. The other ridge, which runs horizontally, is likewife hollow for containing the lateral finufes. Four foffæ are formed by the crofs, two above and two below. In the former are placed the pofterior lobes of the brain, and in the latter the lobes of the cerebellum.

At the bafis of the cranium, we obferve the cuneiform procefs (which is the name given to the great apophyfis at the fore part of this bone); it ferves for the reception of the medulla oblongata.

The os occipitis is of greater ftrength and thicknefs than either of the other bones of the head, though irregularly fo; at its inferior part, where it is thinneft, it is covered by a great number of mufcles.

This bone, from its fituation, being more liable to be injured by falls than any other bone of the head, nature has wifely given it the greateft ftrength at its upper part, where it is moft expofed to danger.

It is joined to the parietal bones by the lambdoidal future, and to the offa temporum, by the additamentum of the temporal future. It is likewife connected to the os fphenoides by the cuneiform procefs. It is by means of the os occipitis that the head is united to the trunk, the two condyles of this bone being connected to the fuperior oblique proceffes of the firft vertebra of the neck.

15 Of the temporal bones.

There are two temporal bones, one on each fide.—We may diftinguifh in them two parts; one of which is called the *fquamous* or *fcaly part*, and the other *pars petrofa* from its hardnefs. This laft is fhaped like a pyramid.

Each of thefe divifions affords proceffes and cavities: externally there are three proceffes; one anterior, called the zygomatic procefs; one pofterior, called the *maftoid* or *mamillary procefs*, from its refemblance to a nipple; and one inferior, called the *ftyloid procefs*, becaufe it is fhaped like a ftiletto, or dagger.

The cavities are, 1. The meatus auditorius externus. 2. A large foffa which ferves for the articulation of the lower jaw; it is before the meatus auditorius, and immediately under the zygomatic procefs. 3. The ftylo-maftoid hole, fo called from its fituation between the ftyloid and maftoid proceffes; it is likewife ftyled the aquæduct of Fallopius, and affords a paffage to the portio dura of the auditory, or feventh pair of nerves. 4. Below, and on the fore-part of the laft foramen, we obferve part of the jugular foffa, in which the beginning of the internal jugular vein is lodged. Anterior and fuperior to this foffa is the orifice of a foramen, through which paffes the carotid artery. This foramen runs firft upwards and then forwards, forming a kind of elbow, and terminates at the end of the os petrofum.—At this part of each temporal bone, we may obferve the opening of the Euftachian tube, a canal which paffes from the ear to the back part of the nofe.

In examining the internal furface of thefe bones, we may remark the triangular figure of their petrous part which feparates two foffæ; one fuperior and anterior; the other inferior and pofterior: the latter of thefe compofes part of the foffa, in which the cerebellum is placed;

(G) The lambdoidal future is fometimes very irregular, being compofed of many fmall futures, which furround fo many little bones called *offa triquetra*, though perhaps improperly, as they are not always triangular.

Osteology. placed; and the former, a portion of the least fossa for the basis of the brain. On the posterior side of the pars petrosa, we observe the meatus auditorus internus, into which enters the double nerve of the seventh pair. On the under side of this process, part of a hole appears, which is common to the temporal and occipital bones; through it the lateral sinus, the eighth pair, and accessory nerves, pass out of the head.

The pars petrosa contains several little bones called the bones of the ear; which, as they do not enter into the formation of the cranium, shall be described when we are treating of the organs of hearing.

The ossa temporum are joined to the ossa malarum, by the zygomatic sutures; to the parietal bones, by the squamous sutures; to the os occipitis, by the lambdoidal suture; and to the sphenoid bone, by the suture of that name.

16 Of the os sphenoides.

This bone, from its situation amidst the other bones of the head, has been sometimes called *cuneiforme*. It is of a very irregular figure, and has been compared to a bat with its wings extended.

It is commonly divided into its middle part or body, and its sides or wings.

The fore part of the body has a spine or ridge, which makes part of the septum narium. The upper part of each wing forms a share of the temple. The fore part of this belongs to the orbit; while the under and back part, termed *spinous process*, is lodged in the base of the skull at the point of the pars petrosa. But two of the most remarkable processes are the pterygoid or aliform, one on each side of the body of the bone, and at no great distance from it. Each of these processes is divided into two wings, and of these the exterior one is the widest. The other terminates in a hook-like process.

The internal surface of this bone affords three fossæ. Two of these are formed by the wings of the bone, and make part of the lesser fossæ of the basis of the cranium. The third, which is smaller, is on the top of the body of the bone; and is called *sella turcica*, from its resemblance to a Turkish saddle. This fossa, in which the pituitary gland is placed, has posteriorly and anteriorly processes called the *clinoid processes*.

There are twelve holes in this bone, viz. six on each side. The first is the passage of the optic nerve and ocular artery; the second, or large slit, transmits the third, fourth, sixth, and first part of the fifth pair of nerves with the ocular vein; the third hole gives passage to the second branch of the fifth pair; and the fourth hole to the third branch of the fifth pair of nerves. The fifth hole is the passage of the artery of the dura mater. The sixth hole is situated above the pterygoid process of the sphenoid bone: through it a reflected branch of the second part of the fifth pair passes.

Within the substance of the os sphenoides there are two sinuses separated by a bony plate. They are lined with the pituitary membrane; and, like the frontal sinuses, separate a mucus which passes into the nostrils.

The os sphenoides is joined to all the bones of the cranium; and likewise to the ossa maxillaria, ossa malarum, ossa palati, and vomer.

This bone makes part of the basis of the skull, assists in forming the orbits, and affords attachment to several muscles.

The os ethmoides is situated at the fore part of the basis of the cranium, and is of a very irregular figure. From the great number of holes with which it is pierced, it is sometimes called *os cribriforme* or sieve-like bone.

17 Of the os ethmoides or cribriforme.

It consists of a middle part and two sides. The middle part is formed of a thin bony plate, in which are an infinite number of holes that afford a passage to filaments of the olfactory nerve. From the middle of this plate, both on the outside and from within, there rises up a process, which may be easily distinguished. The inner one is called *crista galli*, from its supposed resemblance to a cock's comb. To this process the falx of the dura mater is attached. The exterior process, which has the same common basis as the crista galli, is a fine lamella which is united to the vomer; and divides the cavity of the nostrils, though unequally, it being generally a little inclined to one side.

The lateral parts of this bone are composed of a cellular substance; and these cells are so very intricate, that their figure or number cannot be described. Many writers have on this account called this part of the bone the *labyrinth*. These cells are externally covered with a very thin bony lamella. This part of the bone is called the *os planum*, and forms part of the orbit.

The different cells of this bone, which are numerous, and which are every where lined with the pituitary membrane, evidently serve to enlarge the cavity of the nose, in which the organ of smelling resides.

This bone is joined to the os sphenoides, os frontis, ossa maxillaria, ossa palati, ossa nasi, ossa unguis, and vomer.

The ancients, who considered the brain as the seat of all the humours, imagined that this viscus discharged its redundant moisture through the holes of the ethmoid bone. And the vulgar still think, that abscesses of the brain discharge themselves through the mouth and ears, and that snuff is liable to get into the head; but neither snuff nor the matter of an abscess are more capable of passing through the cribriform bone, than the serosity which they supposed was discharged through it in a common cold.—All the holes of the ethmoid bone are filled up with the branches of the olfactory nerve. Its inner part is likewise covered with the dura mater, and its cells are every where lined with the pituitary membrane; so that neither matter nor any other fluid can possibly pass through this bone either externally or internally. Matter is indeed sometimes discharged through the nostrils; but the seat of the disease is in the sinuses of the nose, and not in the brain; and imposthumations are observed to take place in the ear, which suppurate and discharge themselves externally.

Before we leave the bones of the head, we wish to make some general observations on its structure and figure.—As the cranium might have been composed of a single bone, the articulation of its several bones being absolutely without motion, it may be asked perhaps, Why such a multiplicity of bones, and so great number of sutures? Many advantages may possibly arise from this plurality of bones and sutures, which may not yet have been observed. We are able, however, to point out many useful ends, which could only be accomplished by this peculiarity of structure.—In this, as in all the other works of nature, the great wisdom of the Creator is evinced, and cannot fail to excite our admiration and gratitude.

The cranium, by being divided into several bones, grows much faster and with greater facility, than if it was

 was compoſed of one piece only. In the fœtus, the bones, as we have before obſerved, are perfectly diſtinct from each other. The oſſification begins in the middle of each bone, and proceeds gradually to the circumference. Hence the oſſification, and of courſe the increaſe of the head, is carried on from an infinite number of points at the ſame time, and the bones conſequently approach each other in the ſame proportion. To illuſtrate this doctrine more clearly, if it can want further illuſtration, ſuppoſe it neceſſary for the parietal bones which compoſe the upper part of the head, to extend their oſſification, and form the fore part of the head likewiſe.—Is it not evident, that this proceſs would be much more tedious than it is now, when the os frontis and the parietal bones are both growing at the ſame time? Hence it happens, that the heads of young people, in which the bones begin to touch each other, increaſe ſlowly; and that the proportionate increaſe of the volume of the head is greater in three months in the fœtus, than it is perhaps in twenty-four months at the age of fourteen or fifteen years.

The ſutures, excluſive of their advantages in ſuſpending the proceſſes of the dura mater, are evidently of great utility in preventing the too great extent of fractures of the ſkull.—Suppoſe, for inſtance, that by a fall or blow, one of the bones of the cranium becomes fractured. The fiſſure, which in a head compoſed of only one bone, would be liable to extend itſelf through the whole of it, is checked, and ſometimes perhaps ſtopped by the firſt ſuture it meets, and the effects of the injury are confined to the bone on which the blow was received. Ruyſch indeed, and ſome others, will not allow the ſutures to be of any ſuch uſe; but caſes have been met with where they ſeemed to have had this effect, and in young ſubjects their utility in this reſpect muſt be ſtill more obvious.

The ſpherical ſhape of the head ſeems likewiſe to render it more capable of reſiſting external violence than any other ſhape would do. In a vault, the parts mutually ſupport and ſtrengthen each other, and this happens in the cranium.

§ 2. *Proper Bones of the Face.*

18 Of the bones of the face.

THE face, which conſiſts of a great number of bones, is commonly divided into the upper and lower jaws. The upper jaw conſiſts of thirteen bones, excluſive of the teeth. Of theſe, ſix are placed on each ſide of the maxilla ſuperior, and one in the middle.

The bones, which are in pairs, are the oſſa malarum, oſſa maxillaria, oſſa naſi, oſſa unguis, oſſa palati, and oſſa ſpongioſa inferiora. The ſingle bone is the vomer.

19 Of the oſſa malarum.

Theſe are the prominent ſquare bones which are placed under the eyes, forming part of the orbits and the upper part of the cheeks. Each of them affords three ſurfaces; one exterior and a little convex; a ſecond ſuperior and concave, forming the inferior part and ſides of the orbit; and a third poſterior, irregular, and hollowed for the lodgement of the lower part of the temporal muſcle.

The angles of each bone form four proceſſes, two of which may be called *orbitar proceſſes*; of theſe the upper one is joined by ſuture to the os frontis, and that below to the maxillary bone. The third is connected with the os ſphenoides by means of the tranſverſe ſuture; and the fourth is joined to the zygomatic proceſs of the temporal bone, with which it forms the zygoma.

20 Of the oſſa maxillaria ſuperiora.

Theſe bones, which are of a very irregular figure, are ſo called becauſe they form the moſt conſiderable portion of the upper jaw. They are two in number, and generally remain diſtinct through life.

Of the many proceſſes which are to be ſeen on theſe bones, and which are connected with the bones of the face and ſkull, we ſhall deſcribe only the moſt remarkable.

One of theſe proceſſes is at the upper and fore part of the bone, making part of the ſide of the noſe, and called the *naſal proceſs*. Another forms a kind of circular ſweep at the inferior part of the bone, in which are the alveoli or ſockets for the teeth: this is called the *alveolar proceſs*. A third proceſs is united to the os malæ on each ſide. Between this and the naſal proceſs there is a thin plate, which forms a ſhare of the orbit, and lies over a paſſage for the ſuperior maxillary veſſels and nerves.—The alveolar proceſs has poſteriorly a conſiderable tuberoſity on its internal ſurface, called the *maxillary tuberoſity*.

Behind the alveolar proceſs we obſerve two horizontal lamellæ, which uniting together, form part of the roof of the mouth, and divide it from the noſe. The hollowneſs of the roof of the mouth is owing to this partition's being ſeated ſomewhat higher than the alveolar proceſs.—At the fore part of the horizontal lamellæ there is a hole called *foramen inciſivum*, through which ſmall blood-veſſels and nerves go between the mouth and noſe.

In viewing theſe bones internally, we obſerve a foſſa in the inferior portion of the naſal proceſs, which, with the os unguis and os ſpongioſum inferius, forms a paſſage for the lachrymal duct.

Where theſe two bones are united to each other, they project ſomewhat upwards and forwards, leaving between them a furrow, into which the lower portion of the ſeptum naſi is admitted.

Each of theſe bones being hollow, a conſiderable ſinus is formed under its orbitar part. This cavity, which is uſually named after Highmore, though it was deſcribed by Fallopius and others before his time, is lined with the pituitary membrane. It is intended for the ſame purpoſes as the other ſinuſes of the noſe, and opens into the noſtrils.

The oſſa maxillaria are connected with the greater part of the bones of the face and cranium, and aſſiſt in forming not only the cheeks, but likewiſe the palate, noſe, and orbits.

21 Of the oſſa naſi.

The oſſa naſi form two irregular ſquares. They are thicker and narrower above than below. Externally they are ſomewhat convex, and internally ſlightly concave. Theſe bones conſtitute the upper part of the noſe. At their fore part they are united to each other, above to the os frontis, by their ſides to the oſſa maxillaria ſuperiora, poſteriorly and interiorly to the ſeptum narium, and below to the cartilages that compoſe the reſt of the noſtrils.

22 Of the oſſa unguis.

Theſe little tranſparent bones owe their name to their ſuppoſed reſemblance to a finger-nail. Sometimes they are called *oſſa lachrymalia*, from their concurring with the naſal proceſs of each maxillary bone in forming a lodgement for the lachrymal ſac and duct.

Osteology.

The offa unguis are of an irregular figure. Their external furface confifts of two fmooth parts, divided by a middle ridge. One of thefe parts, which is concave and neareft to the nofe, ferves to fupport the lachrymal fac and part of the lachrymal duct. The other, which is flat, forms a fmall part of the orbit.

Each of thefe bones is connected with the os frontis, os ethmoides, and os maxillare fuperius.

23 Of the offa palati.

Thefe bones, which are fituated at the back part of the roof of the mouth, between the os fphenoides and the offa maxillaria fuperiora, are of a very irregular fhape, and ferve to form the nafal and maxillary foffa, and a fmall portion of the orbit. Where they are united to each other, they rife up into a fpine on their internal furface. This fpine appears to be a continuation of that of the fuperior maxillary bones, and helps to form the feptum narium.

Thefe bones are joined to the offa maxillaria fuperiora, os ethmoides, os fphenoides, and vomer.

24 Of the vomer.

This bone derives its name from its refemblance to a ploughfhare. It is a long and flat bone, fomewhat thicker at its back than at its fore part. At its upper part we obferve a furrow extending through its whole length. The pofterior and largeft part of this furrow receives a procefs of the fphenoid bone. From this the furrow advances forwards, and becoming narrower and fhallower, receives fome part of the nafal lamella ethmoidea; the reft ferves to fupport the middle cartilage of the nofe.

The inferior portion of this bone is placed on the nafal fpine of the maxillary and palate bones, which we mentioned in our defcription of the offa palati.

The vomer is united to the os fphenoides, os ethmoides, offa maxillaria fuperiora, and offa palati. It forms part of the feptum narium, by dividing the back part of the nofe into two noftrils.

25 Of the offa fpongiofa inferiora.

The parts which are ufually defcribed by this name, do not feem to deferve to be diftinguifhed as diftinct bones, except in young fubjects. They confift of a fpongy lamella in each noftril, which is united to the fpongy lamina of the ethmoid bone, of which they are by fome confidered as a part.

Each of thefe lamellæ is longeft from behind forwards; with its convex furface turned towards the feptum narium, and its concave part towards the maxillary bone, covering the opening of the lachrymal duct into the nofe.

Thefe bones are covered with the pituitary membrane; and, befides their connection with the ethmoid bone, are joined to the offa maxillaria fuperiora, offa palati, and offa unguis.

26 Of the maxilla inferior.

The maxilla inferior, or lower jaw, which in its fhape refembles a horfe-fhoe, confifts of two diftinct bones in the fœtus; but thefe unite together foon after birth, fo as to form only one bone. The upper edge of this bone, like the os maxillare fuperius, has an alveolar procefs, furnifhed with fockets for the teeth.

On each fide, the pofterior part of the bone rifes almoft perpendicularly into two proceffes. The higheft of thefe, called the coronoid procefs, is pointed and thin, and ferves for the infertion of the temporal mufcle. The other, or condyloid procefs as it is called, is fhorter and thicker, and ends in an oblong rounded head, which is received into a foffa of the temporal bone, and is formed for a moveable articulation with the cranium. This joint is furnifhed with a moveable cartilage. At the bottom of each coronoid procefs, on its inner part, we obferve a foramen extending under the roots of all the teeth, and terminating at the outer furface of the bone near the chin. Each of thefe canals tranfmits an artery, vein, and nerve, from which branches are fent off to the teeth.

The lower jaw is capable of a great variety of motion. By fliding the condyles from the cavity towards the eminences on each fide, we bring it horizontally forwards, as in biting; or we may bring the condyles only forward, and tilt the reft of the jaw backward, as in opening the mouth. We are likewife able to flide the condyles alternately backwards and forwards from the cavity to the eminence, and *vice verfa*, as in grinding the teeth. The cartilages, by adapting themfelves to the different inequalities in thefe feveral motions of the jaw, ferve to fecure the articulation, and to prevent any injuries from friction.

The alveolar proceffes are compofed of an outer and inner bony plate, united together by thin partitions, which at the fore part of the jaw divide the proceffes into as may fockets as there are teeth. But at the back part of the jaw, where the teeth have more than one root, we find a diftinct cell for each root. In both jaws thefe proceffes begin to be formed with the teeth; they likewife accompany them in their growth, and gradually difappear when the teeth are removed.

§ 3. *Of the Teeth.*

Of the teeth.

The teeth are bones of a particular ftructure, formed for the purpofes of maftication and the articulation of the voice. It will be neceffary to confider their compofition and figure, their number and arrangement, and the time and order in which they appear.

In each tooth we may diftinguifh a body, a neck, and a root or fangs.

The body of the tooth is that part which appears above the gums. The root is fixed into the focket, and the neck is the middle part between the two.

The teeth are compofed of two fubftances, viz. enamel and bone. The enamel, or the vitreous or cortical part of the tooth, is a white and very hard and compact fubftance peculiar to the teeth, and appears fibrous or ftriated when broken. This fubftance is thickeft on the grinding furface, and becoming gradually thinner, terminates infenfibly at the neck of the tooth. Ruyfch * affirmed, that he could trace the arteries into the hardeft part of the teeth; Liewenhoeck † fufpected the fibres of the enamel to be fo many veffels; and Monro ‡ fays, he has frequently injected the veffels of the teeth in children, fo as to make the infide of the cortex appear perfectly red. But it is certain, that it is not tinged by a madder diet, and that no injection will ever reach it, fo that it has no appearance of being vafcular ||.

* *Thefaur.* 10. no. 27.

† *Arcan. Natur. continuat. Epiftol.*

‡ *Anat. of the Human Bones.*

|| *Hunter on the Teeth.*

The bony part, which compofes the inner fubftance of the body, neck, and root of the tooth, refembles other bones in its ftructure, but it is much harder than the moft compact part of bones in general. As a tooth when once formed receives no tinge from a madder diet, and as the minuteft injections do not penetrate into its fubftance, this part of a tooth has, like the enamel, been fuppofed not to be vafcular. But when we confider that the fangs of a tooth are invefted by

by a periosteum, and that the swellings of these fangs are analogous to the swellings of other bones, we may reasonably conclude, that there is a similarity of structure; and that this bony part has a circulation through its substance, although from its hardness we are unable to demonstrate its vessels.

In each tooth we find an inner cavity, into which enter an artery, vein, and nerve. This cavity begins by a small opening, and becoming larger, terminates in the body of the tooth. In advanced life this hole sometimes closes, and the tooth is of course rendered insensible.

The periosteum surrounds the teeth from their fangs to a little beyond their bony sockets, where we find it adhering to the gums. This membrane, while it incloses the teeth, serves at the same time to line the sockets, so that it may be considered as common to both.

The teeth are likewise secured in their sockets by means of the gums; a red, vascular, firm, and elastic substance, that possesses but little sensibility. In the gums of infants we find a hard ridge extending through their whole length, but no such ridge is to be seen in old people who have lost their teeth.

The number of the teeth in both jaws at full maturity, usually varies from twenty-eight to thirty-two. They are commonly divided into three classes, viz. incisores, canini, and grinders or molares (H). The incisores are the four teeth in the fore part of each jaw. They have each of them two surfaces; one anterior and convex, the other posterior and slightly concave, both of which terminate in a sharp edge. They are called *incisores* from their use in dividing the food. They are usually broader and thicker in the upper than in the under jaw; and, by being placed somewhat obliquely, generally fall over the latter.

The canini derive their name from their resemblance to a dog's tusks, being the longest of all the teeth. We find one on each side of the incisores, so that there are two canini in each jaw. Their fang resembles that of the incisores, but is much larger; and in their shape they appear like an incisor with its edge worn off, so as to terminate in a narrow point.

These teeth not being calculated for cutting and dividing the food like the incisores, or for grinding it like the molares, seem to be intended for laying hold of substances (I).

The molares or grinders, of which there are ten in each jaw, are so called, because from their shape and size they are fitted for grinding the food. Each of the incisores and canini is furnished only with one fang; but in the molares of the under jaw we constantly find two fangs, and in those of the upper jaw three fangs. These fangs are sometimes separated into two points, and each of these points has sometimes been described as a distinct fang.

The two first of the molares, or those nearest to the canine teeth on each side, differ from the other three, and are with great propriety named *bicuspides* by Mr Hunter. They have sometimes only one root, and seem to be of a middle nature between the incisores and the larger molares. The two next are much larger. The fifth or last grinder on each side is smaller and shorter than the rest; and from its not cutting the gum till after the age of twenty, and sometimes not till much later in life, is called *dens sapientiæ*.

There is in the structure and arrangement of all these teeth an art which cannot be sufficiently admired. To understand it properly, it will be necessary to consider the under jaw as a kind of lever, with its fixed points at its articulations with the temporal bones:—it will be right to observe, too, that its powers arise from its different muscles, but in elevation chiefly from the temporalis and masseter; and that the aliment constitutes the object of resistance. It will appear, then, that the molares, by being placed nearest the centre of motion, are calculated to press with a much greater force than the other teeth, independent of their grinding powers which they possess by means of the pterygoid muscles; and that it is for this reason we put between them any hard body we wish to break.

The canini and incisores are placed farther from this point, and of course cannot exert so much force; but they are made for cutting and tearing the food, and this form seems to make amends for their deficiency in strength.

There are examples of children who have come into the world with two, three, and even four teeth: but these examples are very rare; and it is seldom before the seventh, eighth, or ninth month after birth, that the incisores, which are the first formed, begin to pass through the gum. The symptoms of dentition, however, in consequence of irritation from the teeth, frequently take place in the fourth or fifth month.—About the twentieth or twenty-fourth month, the canini and two molares make their appearance.

The dangerous symptoms that sometimes accompany dentition, are owing to the pressure of the teeth on the gum, which they irritate so as to excite pain and inflammation. This irritation seems to occasion a gradual wasting of the gum at the part, till at length the tooth makes its appearance.

The symptoms are more or less alarming, in proportion to the resistance which the gum affords to the teeth, and according to the number of teeth which may chance to seek a passage at the same time. Were they all to appear at once, children would fall victims to the pain and excessive irritation; but Nature has so very wisely disposed them, that they usually appear one after the other, with some distance of time between each. The first incisor that appears is generally in the lower jaw, and is followed by one in the upper

(H) Mr Hunter has thought proper to vary this division. He retains the old name of *incisores* to the four fore teeth, but he distinguishes the canine teeth by the name of the *cuspidati*. The two teeth which are next to these, and which have been usually ranked with the molares, he calls the *bicuspides*; and he gives the name of *grinders* only to the three last teeth on each side.

(I) Mr Hunter remarks of these teeth, that we may trace in them a similarity in shape, situation, and use, from the most imperfectly carnivorous animal, which we believe to be the human species, to the lion, which is the most perfectly carnivorous.

 per jaw. Sometimes the canini, but more commonly one of the molares, begins to paſs through the gum firſt.

Theſe 20 teeth, viz. eight inciſores, four canini, and eight molares, are called *temporary* or *milk teeth*, becauſe they are all ſhed between the age of ſeven and 14, and are ſucceeded by what are called the *permanent* or *adult teeth*. The latter are of a firmer texture, and have larger fangs.

Theſe adult teeth being placed in a diſtinct ſet of alveoli, the upper ſockets gradually diſappear, as the under ones increaſe in ſize, till at length the temporary, or upper teeth, having no longer any ſupport, conſequently fall out.

To theſe 20 teeth which ſucceed the temporary ones, 12 others are afterwards added, viz. three molares on each ſide in both jaws: and in order to make room for this addition, we find that the jaws gradually lengthen in proportion to the growth of the teeth; ſo that with 20 teeth, they ſeem to be as completely filled as they are afterwards with 32. This is the reaſon why the face is rounder and flatter in children than in adults.

With regard to the formation of the teeth, we may obſerve, that in a fœtus of four months, the alveolar proceſs appears only as a ſhallow longitudinal groove, divided by minute ridges into a number of intermediate depreſſions; in each of which we find a ſmall pulpy ſubſtance, ſurrounded by a vaſcular membrane. This pulp gradually oſſifies, and its lower part is lengthened out to form the fang. When the bony part of the tooth is formed, its ſurface begins to be incruſted with the enamel. How the latter is formed and depoſited, we are not yet able to determine.

The rudiments of ſome of the adult teeth begin to be formed at a very early period, for the pulp of one of the inciſores may generally be perceived in a fœtus of eight months, and the oſſification begins in it ſoon after birth. The firſt bicuſpis begins to oſſify about the fifth or ſixth, and the ſecond about the ſeventh year. The firſt adult grinder cuts the gum about the 12th, the ſecond about the 18th, and the third, or *dens ſapientiæ*, uſually between the 20th and 30th year.

The teeth, like other bones, are liable to be affected by diſeaſe. Their removal is likewiſe the natural conſequence of old age; for as we advance in life, the alveoli fill up, and the teeth, eſpecially the inciſores, fall out. When this happens, the chin projects forward, and the face is much ſhortened.

§ 4. *Of the Os Hyoides* (K).

28. The os hyoides, which is placed at the root of the tongue, was ſo called by the ancients on account of its ſuppoſed reſemblance to the Greek letter υ.

It will be neceſſary to diſtinguiſh in it, its body, horns, and appendices.

The body, which is the middle and broadeſt part of the bone, is ſo placed that it may be eaſily felt at the fore part of the throat. Anteriorly it is irregularly convex, and its inner ſurface is unequally concave. Its cornua, or horns, which are flat and a little bent, being much longer than the body part, may be deſcribed as forming the ſides of the υ. The appendices, or little horns, as they are called by M. Winſlow, and ſome other writers, are two proceſſes which riſe up from the articulations of the cornua with the body, and are uſually connected with the ſtyloid proceſs on each ſide by means of a ligament.

The uſes of this bone are to ſupport the tongue, and afford attachment to a great number of muſcles; ſome of which perform the motions of the tongue, while others act on the larynx and fauces.

Sect. III. *Of the Bones of the Trunk.*

The trunk of the ſkeleton conſiſts of the ſpine, the thorax, and the pelvis. 29.

§ 1. *Of the Spine.*

The ſpine is compoſed of a great number of bones called *vertebræ*, forming a long bony column, in figure not much unlike the letter *ſ*. This column, which extends from the head to the lower part of the body, may be ſaid to conſiſt of two irregular and unequal pyramids, united to each other in that part of the loins where the laſt lumbar vertebra joins the os ſacrum. 30.

The vertebræ of the upper and longeſt pyramid are called *true vertebræ*, in contradiſtinction to thoſe of the lowermoſt pyramid, which, from their being immoveable in the adult, are ſtyled *falſe vertebræ*. It is upon the bones of the ſpine that the body turns; and it is to this circumſtance they owe their name, which is derived from the Latin verb *vertere*, to turn.

The true vertebræ are divided into three claſſes of cervical, dorſal, and lumbar vertebræ.—The falſe vertebræ conſiſt of the os ſacrum and os coccygis.

In each vertebra, as in other bones, it will be neceſſary to remark the body of the bone, its proceſſes, and cavities.

The body, which is convex before, and concave behind, where it aſſiſts in forming the cavity of the ſpine, may be compared to part of a cylinder cut off tranſverſely.

Each vertebra affords ſeven proceſſes. The firſt is at the back part of the vertebra, and from its ſhape and direction is named the *ſpinous proceſs*. On each ſide of this are two others, which, from their ſituation with reſpect to the ſpine, are called *tranſverſe proceſſes*. The four others are ſtyled *oblique* or *articular proceſſes*. They are much ſmaller than the ſpinous or tranſverſe ones. Two of them are placed on the upper, and two on the lower part of each vertebra, riſing from near the baſis of each tranſverſe proceſs. They have gotten the name of *oblique proceſſes*, from their ſituation with reſpect to the proceſſes with which they are articulated; and they are ſometimes ſtyled *articular proceſſes*, from the manner in which they are articulated with each other; the two ſuperior proceſſes of one vertebra being articulated with

(K) This bone is very ſeldom preſerved with the ſkeleton, and cannot be included amongſt the bones of the head or in any other diviſion of the ſkeleton. Thomas Bartholin has perhaps very properly deſcribed it among the parts contained in the mouth; but the generality of anatomical writers have placed it, as it is here, after the bones of the face.

with the two inferior proceſſes of the vertebra above it. Each of theſe proceſſes is covered with cartilage at its articulation, and their articulations with each other are by a ſpecies of ginglimus.

In each vertebra, between its body and its proceſſes, we find a hole large enough to admit a finger. Theſe holes or foramina, correſpond with each other through all the vertebræ, and form the long bony channel in which the ſpinal marrow is placed. We may likewiſe obſerve four notches in each vertebra. Two of theſe notches are at the upper, and two at the lower part of the bone, between the oblique proceſſes and the body of the vertebra. Each of theſe notches meeting with a ſimilar opening in the vertebra above or below it, forms a foramen for the paſſage of blood-veſſels, and of the nerves out of the ſpine.

The bones of the ſpine are united together by means of a ſubſtance, which in young ſubjects appears to be of a ligamentous, but in adults more of a cartilaginous nature. This intervertebral ſubſtance, which forms a kind of partition between the ſeveral vertebræ, is thicker and more flexible between the lumbar vertebræ than in the other parts of the ſpine, the moſt conſiderable motions of the trunk being performed on thoſe vertebræ. This ſubſtance being very elaſtic, the extenſion and flexion of the body, and its motion backwards and forwards, or to either ſide, are performed with great facility. This elaſticity ſeems to be the reaſon why people who have been long ſtanding, or have carried a conſiderable weight, are found to be ſhorter than when they have been long in bed. In the two firſt inſtances the intervertebral cartilages (as they are uſually called) are evidently more expoſed to compreſſion than when we are in bed in an horizontal poſture.

In advanced life theſe cartilages become ſhrivelled, and of courſe loſe much of their elaſticity. This may ſerve to account for the decreaſe in ſtature and the ſtooping forward which are uſually to be obſerved in old people.

Beſides the connection of the ſeveral vertebræ by means of this intervertebral ſubſtance, there are likewiſe many ſtrong ligaments, both external and internal, which unite the bones of the ſpine to each other. Their union is alſo ſtrengthened by a variety of ſtrong muſcles that cover and ſurround the ſpine.

The bones of the ſpine are found to diminiſh in denſity, and to be leſs firm in their texture in proportion as they increaſe in bulk; ſo that the lowermoſt vertebræ, though the largeſt, are not ſo heavy in proportion as the upper ones. By this means the ſize of theſe bones is increaſed without adding to their weight; a circumſtance of no little importance in a part like the ſpine, which, beſides flexibility and ſuppleneſs, ſeems to require lightneſs as one of its eſſential properties.

In very young children, each vertebra conſiſts of three bony pieces united by cartilages which afterwards oſſify.

31 Vertebræ of the neck.

There are ſeven vertebræ of the neck—they are of a firmer texture than the other bones of the ſpine. Their tranſverſe proceſſes are forked for the lodgement of muſcles, and at the bottom of each we obſerve a foramen, through which paſs the cervical artery and vein. The firſt and ſecond of theſe vertebræ muſt be deſcribed more particularly. The firſt approaches almoſt to an oval ſhape—On its ſuperior ſurface it has two cavities which admit the condyles of the occipital bone with which it is articulated. This vertebra, which is called *atlas* from its ſupporting the head, cannot well be deſcribed as having either body or ſpinous proceſs, being a kind of bony ring. Anteriorly, where it is articulated to the odontoid proceſs of the ſecond vertebra, it is very thin. On its upper ſurface it has two cavities which admit the condyles of the occipital bone. By this connection the head is allowed to move forwards and backwards, but has very little motion in any other direction.

The ſecond vertebra has gotten the name of *dentata*, from its having, at its upper and anterior part, a proceſs called the *odontoid* or *tooth-like proceſs*, which is articulated with the atlas, to which this ſecond vertebra may be ſaid to ſerve as an axis. This odontoid proceſs is of a cylindrical ſhape, ſomewhat flattened, however, anteriorly and poſteriorly. At its fore-part where it is received by the atlas, we may obſerve a ſmooth, convex, articulating ſurface. It is by means of this articulation that the head performs its rotatory motion, the atlas in that caſe moving upon this odontoid proceſs as upon a pivot. But when this motion is in any conſiderable degree, or, in other words, when the head moves much either to the right or left, all the cervical vertebræ ſeem to aſſiſt, otherwiſe the ſpinal marrow would be in danger of being divided tranſverſely by the firſt vertebra.

32 Vertebræ of the back.

The ſpinous proceſs of each of the cervical vertebræ is ſhorter, and their articular proceſſes more oblique, than in the other bones of the ſpine.

Theſe 12 vertebræ are of a middle ſize between thoſe of the neck and loins. At their ſides we may obſerve two depreſſions, one at the upper and the other at the lower part of the body of each vertebra; which uniting with ſimilar depreſſions in the vertebræ above and below, form articulating ſurfaces, covered with cartilages, for receiving the heads of the ribs; and at the fore-part of their tranſverſe proceſs (excepting the two laſt) we find an articulating ſurface for receiving the tuberoſity of the ribs.

33 Lumbar vertebræ.

Theſe five vertebræ differ only from thoſe of the back in their being larger, and in having their ſpinous proceſſes at a greater diſtance from each other. The moſt conſiderable motions of the trunk are made on theſe vertebræ; and theſe motions could not be performed with ſo much eaſe, were the proceſſes placed nearer to each other.

34 Os ſacrum.

The os ſacrum, which is compoſed of five or ſix pieces in young ſubjects, becomes one bone in more advanced age.

It is nearly of a triangular figure, its inferior portion being bent a little forwards. Its ſuperior part has two oblique proceſſes which are articulated with the laſt of the lumbar vertebræ; and it has likewiſe commonly three ſmall ſpinous proceſſes, which gradually become ſhorter, ſo that the lowermoſt is not ſo long as the ſecond, nor the ſecond as the uppermoſt. Its tranſverſe proceſſes are formed into one oblong proceſs, which becomes gradually ſmaller as it deſcends. Its concave or anterior ſide is uſually ſmooth, but its poſterior convex ſide has many prominences (the moſt remarkable of which are the ſpinous proceſſes juſt now mentioned), which are filled up and covered with the muſcular and tendinous parts behind.

This

Osteology. This bone has five pair of holes, which afford a paſſage to blood-veſſels, and likewiſe to the nerves that are derived from the ſpinal marrow, which is continued even here, being lodged in a triangular cavity, that becomes ſmaller as it deſcends, and at length terminates obliquely at the lower part of this bone. Below the third diviſion of the os ſacrum, this canal is not completely bony as in the reſt of the ſpine, being ſecured at its back part only by a very ſtrong membrane, ſo that a wound at this part muſt be extremely dangerous.

The os ſacrum is united laterally to the oſſa innominata or hip-bones, and below to the coccyx.

35 Os coccyx. The coccyx, which, like the os ſacrum, is in young people made up of three or four diſtinct parts, uſually becomes one bone in the adult ſtate.

It ſerves to ſupport the inteſtinum rectum ; and, by its being capable of ſome degree of motion at its articulation with the ſacrum, and being like that bone bent forwards, we are enabled to ſit with eaſe.

This bone is nearly of a triangular ſhape, being broadeſt at its upper part, and from thence growing narrower to its apex, where it is not bigger than the little finger.

It has got its name from its ſuppoſed reſemblance to a cuckow's beak. It differs greatly from the vertebræ, being commonly without any proceſſes, and having no cavity for the ſpinal marrow, or foramina for the tranſmiſſion of nerves.

The ſpine, of which we have now finiſhed the anatomical deſcription, is deſtined for many great and important uſes. The medulla ſpinalis is lodged in its bony canal ſecure from external injury. It ſerves as a defence to the abdominal and thoracic viſcera, and at the ſame time ſupports the head, and gives a general firmneſs to the whole trunk.

We have before compared it to the letter *ſ*, and its different turns will be found to render it not very unlike the figure of that letter.—In the neck we ſee it projecting ſomewhat forward to ſupport the head, which without this aſſiſtance would require a greater number of muſcles—Lower down, in the thorax, we find it taking a curved direction backwards, and of courſe increaſing the cavity of the cheſt. After this, in the loins, it again projects forwards in a direction with the centre of gravity, by which means we are eaſily enabled to keep the body in an erect poſture, for otherwiſe we ſhould be liable to fall forward. Towards its inferior extremity, however, it again recedes backward, and thus aſſiſts in forming the pelvis, the name given to the cavity in which the urinary bladder, inteſtinum rectum, and other viſcera are placed.

If this bony column had been formed only of one piece, it would have been much more eaſily fractured than it is now: and by confining the trunk to a ſtiff ſituation, a variety of motions would have been altogether prevented, which are now performed with eaſe by the great number of bones of which it is compoſed.

It is firm, and yet to this firmneſs there is added a perfect flexibility. If it be required to carry a load upon the head, the neck becomes ſtiff with the aſſiſtance of its muſcles, and accommodates itſelf to the load, as if it was compoſed only of one bone—In ſtooping likewiſe, or in turning to either ſide, the ſpine turns itſelf in every direction, as if all its bones were ſeparated from each other.

In a part of the body, like the ſpine, that is made up of ſo great a number of bones, and intended for ſuch a variety of motion, there muſt be a greater danger of diſlocation than fracture ; but we ſhall find, that this is very wiſely guarded againſt in every direction by the proceſſes belonging to each vertebra, and by the ligaments, cartilages, &c. by which theſe bones are connected with each other.

§ 2. *Of the Bones of the Thorax.* 36

The thorax, or cheſt, is compoſed of many bones, *viz.* the ſternum which is placed at its anterior part, twelve ribs on each ſide which make up its lateral parts, and the dorſal vertebræ which conſtitute its poſterior part. Theſe laſt have been already deſcribed. 37

The ſternum is the long bone which extends itſelf from the upper to the lower part of the breaſt anteriorly, and to which the ribs and the clavicles are articulated. Of the ſternum.

In children it is compoſed of ſeveral bones united by cartilages; but as we advance in life, moſt of theſe cartilages oſſify, and the ſternum in the adult ſtate is found to conſiſt only of three pieces, and ſometimes becomes one bone. It is however generally deſcribed as being compoſed of three parts—one ſuperior, which is broad, thick, and ſhort; and one in the middle, which is thinner, narrower, and longer than the other.

It terminates at its lower part by a third piece, which is called the *xyphoid*, or *ſword-like cartilage*, from its ſuppoſed reſemblance to the blade of a ſword, and becauſe in young ſubjects it is commonly in a cartilaginous ſtate.

We have already obſerved, that this bone is articulated with the clavicle on each ſide. It is likewiſe joined to the fourteen true ribs, *viz.* ſeven on its right and ſeven on its left ſide. 38

The ribs are bones ſhaped like a bow, forming the ſides of the cheſt. There are twelve on each ſide. They are diſtinguiſhed into true and falſe ribs: The ſeven upper ribs which are articulated to the ſternum are called *true ribs*, and the five lower ones that are not immediately attached to that bone are called *falſe ribs*. Of the ribs.

On the inferior and interior ſurface of each rib, we obſerve a ſinuoſity for the lodgement of an artery, vein, and nerve.

The ribs are not bony through their whole length, their anterior part being cartilaginous. They are articulated with the vertebræ and ſternum. Every rib (or at leaſt the greater number of them) has at its poſterior part two proceſſes; one at its extremity, called the head of the rib, by means of which it is articulated with the body of two vertebræ; and another, called its tuberoſity, by which it is articulated with the tranſverſe proceſs of the loweſt of theſe two vertebræ. The firſt rib is not articulated by its extremity to two vertebræ, being ſimply attached to the upper part of the firſt vertebra of the back. The ſeven ſuperior or true ribs are articulated anteriorly with the ſternum by their cartilages; but the falſe ribs are ſupported in a different manner—the eighth, which is the firſt of theſe ribs, being

Osteology. being attached by its cartilage to the feventh; the ninth to the eighth, &c.

The two lowermoft ribs differ likewife from all the reft in the following particulars: They are articulated only with the body of a vertebra, and not with a tranfverfe procefs; and anteriorly, their cartilage is loofe, not being attached to the cartilages of the other ribs; and this feems to be, becaufe the moft confiderable motions of the trunk are not performed on the lumbar vertebræ alone, but likewife on the two laft vertebræ of the back: fo that if thefe two ribs had been confined at the fore part like the other ribs, and had been likewife articulated with the bodies of two vertebræ, and with the tranfverfe proceffes, the motion of the two laft vertebræ, and confequently of the whole trunk, would have been impeded.

The ribs help to form the cavity of the thorax; they afford attachment to different mufcles; they are ufeful in refpiration; and they ferve as a fecurity to the heart and lungs.

39. § 3. *Of the Bones of the Pelvis.*

The pelvis is compofed of the os facrum, os coccygis, and two offa innominata. The two firft of thefe bones were included in the account of the fpine, to which they more properly belong.

In children, each os innominatum is compofed of three diftinct bones; but as we advance in life the intermediate cartilages gradually offify, and the marks of the original feparation difappear, fo that they become one irregular bone; ftill however continuing to retain the names of ilium, ifchium, and pubis, by which their divifions were originally diftinguifhed, and to be defcribed as three different bones by the generality of anatomifts. The os ilium forms the upper and moft confiderable part of the bone, the os ifchium its lower and pofterior portion, and the os pubis its fore part.

40 Os ilium. The os ilium or haunch bone, is articulated pofteriorly to the os facrum by a firm cartilaginous fubftance, and is united to the os pubis before and to the os ifchium below. Its fuperior portion is thin, and terminates in a ridge called the crifta or fpine of the ilium, and more commonly known by the name of the haunch. This crifta rifes up like an arch, being turned fomewhat outwards, fo as to refemble the wings of a phaeton.

Externally this bone is unequally prominent and hollowed for the lodgement of mufcles; internally we find it fmooth and concave. At its lower part there is a confiderable ridge on its inner furface. This ridge extends from the os facrum, and correfponds with a fimilar prominence both on that bone and the ifchium; forms with the inner part of the offa pubis what in midwifery is termed the brim of the pelvis.

The crifta, or fpine, which at firft is an epiphyfis, has two confiderable tuberofities; one anteriorly, and the other pofteriorly, which is the largeft of the two: Thefe, from their projecting more than the parts of the bone below them, have gotten the name of fpinal proceffes. From the anterior fpinous procefs, the fartorious and tenfor vaginæ femoris mufcles have their origin; and below the pofterior procefs we obferve a confiderable niche in the bone, which, in the recent fubject, is formed into a large foramen, by means of a ftrong ligament that is ftretched over its lower part from the os facrum to the fharp-pointed procefs of the ifchium. This hole affords a paffage to the great fciatic nerve, and to the pofterior crural veffels under the pyriform mufcle, part of which likewife paffes out here.

The os ifchium, or hip-bone, which is of a very irregular figure, conftitutes the lower lateral parts of the pelvis, and is commonly divided into its body, tuberofity, and ramus. The body forms the lower and moft confiderable portion of the acetabulum, and fends a fharp-pointed procefs backwards, called the fpine of the ifchium. To this procefs the ligament adheres, which was juft now fpoken of, as forming a foramen for the paffage of the fciatic nerve.—The tuberofity, which is the loweft part of the trunk, and fupports us when we fit, is large and irregular, affording origin to feveral mufcles. From this tuberofity we find the bone becoming thinner and narrower. This part, which has the name of ramus or branch, paffes forwards and upwards, and concurs with the ramus of the os pubis, to form a large hole called the *foramen magnum ifchii*, or *thyroideum*, as it is fometimes named from its refemblance to a door or fhield. This hole, which in the recent fubject is clofed by a ftrong membrane called the obturator ligament, affords through its whole circumference attachment to mufcles. At its upper part where we obferve a niche in the bone, it gives paffage to the obturator veffels and nerves, which go to the inner part of the thigh. Nature feems every where to avoid an unneceffary weight of bone, and this foramen, no doubt, ferves to lighten the bones of the pelvis. 41 Os ifchium.

The os pubis or fhare-bone, which with its fellow forms the fore-part of the pelvis, is the fmalleft divifion of the os innominatum. It is united to its fellow by means of a ftrong cartilage, which forms what is called the fymphyfis pubis. 42 Os pubis.

In each os pubis we may diftinguifh the body of the bone, its angle, and ramus. The body or outer part is united to the os ilium. The angle comes forwards to form the fymphyfis, and the ramus is a thin procefs which unites with the ramus of the ifchium, to form the foramen thyroideum.

The three bones we have defcribed as compofing each os innominatum, all affift in forming the acetabulum, in which the head of the os femoris is received.

This cavity is every where lined with a fmooth cartilage, excepting at its inner part, where we may obferve a little foffa, in which are lodged the mucilaginous glands of the joint. We may likewife notice the pit or depreffion made by the round ligament, as it is improperly called, which, by adhering to this cavity and to the head of the thigh-bone, helps to fecure the latter in the focket.

Thefe bones, which are united to each other and to the fpine by many very ftrong ligaments, ferve to fupport the trunk, and to connect it with the lower extremities; and at the fame time to form the pelvis or bafon, in which are lodged the inteftines and urinary bladder, and in women the uterus; fo that the ftudy of this part of ofteology is of the utmoft importance in midwifery.

It is worthy of obfervation, that in women the os facrum is ufually fhorter, broader, and more hollowed, the offa ilia more expanded, and the inferior opening of the pelvis larger than in men.

Sect. IV. *Of the Extremities.*

43. The parts of the ſkeleton conſiſt of the upper extremity and the lower.

§ 1. *Of the* Upper Extremity.

44. This conſiſts of the ſhoulder, the arm, and the hand.

1. Of the Shoulder.

45. The ſhoulder conſiſts of two bones, the clavicula and
46 the ſcapula.

Of the clavicula.

The former, which is ſo named from its reſemblance to the key in uſe amongſt the ancients, is a little curved at both its extremities like an italic *ſ*. It is likewiſe called *jugulum*, or collar-bone, from its ſituation. It is about the ſize of the little finger, but longer, and being of a very ſpongy ſubſtance, is very liable to be fractured. In this, as in other long bones, we may diſtinguiſh a body and two extremities. The body is rather flattened than rounded. The anterior extremity is formed into a ſlightly convex head, which is nearly of a triangular ſhape. The inferior ſurface of the head is articulated with the ſternum. The poſterior extremity, which is flatter and broader than the other, is connected to a proceſs of the ſcapula, called *acromion*. Both theſe articulations are ſecured by ligaments, and in that with the ſternum we meet with a moveable cartilage, to prevent any injury from friction.

The clavicle ſerves to regulate the motions of the ſcapula, by preventing it from being brought too much forwards, or carried too far backwards. It affords origin to ſeveral muſcles, and helps to cover and protect the ſubclavian veſſels, which derive their name from their ſituation under this bone.

47 Of the ſcapula.

The ſcapula, or ſhoulder-blade, which is nearly of a triangular ſhape, is fixed to the poſterior part of the true ribs, ſomewhat in the manner of a buckler. It is of a very unequal thickneſs, and like all other broad, flat bones, is ſomewhat cellular. Exteriorly it is convex, and interiorly concave, to accommodate itſelf to the convexity of the ribs. We obſerve in this bone three unequal ſides, which are thicker and ſtronger than the body of the bone, and are therefore termed its *coſtæ*. The largeſt of the three, called alſo the baſis, is turned towards the vertebræ. Another, which is leſs than the former, is below this; and the third, which is the leaſt of the three, is at the upper part of the bone. Externally the bone is elevated into a conſiderable ſpine, which riſing ſmall at the baſis of the ſcapula, becomes gradually higher and broader, and divides the outer ſurface of the bone into two foſſæ. The ſuperior of theſe, which is the ſmalleſt, ſerves to lodge the ſupra ſpinatus muſcle; and the inferior foſſa, which is much larger than the other, gives origin to the infra ſpinatus. This ſpine terminates in a broad and flat proceſs at the top of the ſhoulder, called the *proceſſus acromion*, to which the clavicle is articulated. This proceſs is hollowed at its lower part to allow a paſſage to the ſupra and infra ſpinati muſcles. The ſcapula has likewiſe another conſiderable proceſs at its upper part, which, from its reſemblance to the beak of a bird, is called the *coracoid proceſs*. From the outer ſide of this coracoid proceſs, a ſtrong ligament paſſes to the proceſſus acromion, which prevents a luxation of the os humeri upwards. A third proceſs begins by a narrow neck, and ends in a cavity called *glenoid*, for the connection of the os humeri.

The ſcapula is articulated with the clavicle and os humeri, to which laſt it ſerves as a fulcrum; and by varying its poſition it affords a greater ſcope to the bones of the arm in their different motions. It likewiſe gives origin to ſeveral muſcles, and poſteriorly ſerves as a defence to the trunk.

2. Bones of the Arm.

The arm is commonly divided into two parts, which are articulated to each other at the elbow. The upper part retains the name of arm, properly ſo called, and the lower part is uſually called the fore-arm. 48.

The arm is compoſed of a ſingle bone called *os humeri*. This bone, which is almoſt of a cylindrical ſhape, may be divided into its body and its extremities. 49.

The upper extremity begins by a large, round ſmooth head, which is admitted into the glenoid cavity of the ſcapula. On the upper and fore part of the bone there is a groove for lodging the long head of the biceps muſcle of the arm; and on each ſide of the groove, at the upper end of the bone, there is a tubercle to which the ſpinati muſcles are fixed.

The lower extremity has ſeveral proceſſes and cavities. The principal proceſſes are its two condyles, one exterior and the other interior, and of theſe the laſt is the largeſt. Between theſe two we obſerve two lateral protuberances, which, together with a middle cavity, form as it were a kind of pully upon which the motions of the fore-arm are chiefly performed. At each ſide of the condyles, as well exteriorly as interiorly, there is another eminence which gives origin to ſeveral muſcles of the hand and fingers. Poſteriorly and ſuperiorly, ſpeaking with reſpect to the condyles, we obſerve a deep foſſa which receives a conſiderable proceſs of the ulna; and anteriorly and oppoſite to this foſſa, we obſerve another, which is much leſs, and receives another proceſs of the ſame bone.

The body of the bone has at its upper and anterior part a furrow which begins from behind the head of the bone, and ſerves to lodge the tendon of a muſcle. The body of the os humeri is hollow through its whole length, and like all other long bones has its marrow.

This bone is articulated at its upper part to the ſcapula. This articulation, which allows motion every way, is ſurrounded by a capſular ligament that is ſometimes torn in luxation, and becomes an obſtacle to the eaſy reduction of the bone. Its lower extremity is articulated with the bones of the fore-arm. 50

The fore-arm is compoſed of two bones, the ulna and radius. Of the fore-arm.

The ulna or elbow-bone is much leſs than the os humeri, and becomes gradually ſmaller as it deſcends to the wriſt. At its upper part it has two proceſſes and two cavities. Of the two proceſſes, the largeſt, which is ſituated poſteriorly, and called the *olecranon*, is admitted into the poſterior foſſa of the os humeri. The other proceſs is placed anteriorly, and is called the *coronoid proceſs*. In bending the arm it enters into the anterior foſſa of the os humeri. This proceſs being 51 Of the ulna.

Osteology. being much smaller than the other, permits the fore-arm to bend inwards; whereas the olecranon, which is shaped like a hook, reaches the bottom of its fossa in the os humeri as soon as the arm becomes straight, and will not permit the fore-arm to be bent backwards. The ligaments likewise oppose this motion.

Between the two processes we have described, there is a considerable cavity called the sygmoid cavity, divided into two fossæ by a small eminence, which passes from one process to the other; it is by means of this cavity and the two processes, that the ulna is articulated with the os humeri by ginglimus.

At the bottom of the coronoid process interiorly, there is a small sygmoid cavity, which serves for the articulation of the ulna with the radius.

The body of the ulna is of a triangular shape: Its lower extremity terminates by a small head and a little styloid process. The ulna is articulated above to the os humeri—both above and below to the radius, and to the wrist at its lower extremity. All these articulations are secured by means of ligaments. The chief use of this bone seems to be to support and regulate the motions of the radius.

52 Of the radius. The radius, which is so named from its supposed resemblance to the spoke of a wheel, is placed at the inside of the fore-arm. It is somewhat larger than the ulna, but not quite so long as that bone. Its upper part is cylindrical, hollowed superiorly to receive the outer condyle of the os humeri. Laterally it is admitted into the little sygmoid cavity of the ulna, and the cylindrical part of the bone turns in this cavity in the motions of pronation and supination (L). This bone follows the ulna in flexion and extension, and may likewise be moved round its axis in any direction. The lower extremity of the radius is much larger and stronger than its upper part; the ulna, on the contrary, is smaller and weaker below than bove; so that they serve to supply each others deficiencies in both those parts.

On the external side of this bone, we observe a small cavity which is destined to receive the lower end of the ulna; and its lower extremity is formed into a large cavity, by means of which it is articulated with the bones of the wrist, and on this account it is sometimes called *manubrium manus*. It supports the two first bones of the wrist on the side of the thumb, whereas the ulna is articulated with that bone of the wrist which corresponds with the little finger.

Through the whole length both of this bone and the ulna, a ridge is observed which affords attachment to an interosseous ligament. This ligament fills up the space between the two bones.

53. 3. Bones of the Hand.

54 Of the carpus. The carpus or wrist consists of eight small bones of an irregular shape, and disposed in two unequal rows. Those of the upper row are articulated with the bones of the fore-arm, and those of the lower one with the metacarpus.

The ancient anatomists described these bones numerically; Lyserus seems to have been the first who gave to each of them a particular name. The names he adopted are found on the figure of the bones, and are now pretty generally received, except the first, which instead of κοτυλοειδες (the name given to it by Lyserus, on account of its sinus, that admits a part of the os magnum), has by later writers been named *Scaphoides* or *Naviculare*. This, which is the outermost of the upper row (considering the thumb as the outer side of the hand), is articulated with the radius; on its inner side it is connected with the os lunare, and below to the trapezium and trapezoides. Next to this is a smaller bone, called the *os lunare*; because its outer side, which is connected with the scaphoides, is shaped like a crescent. This is likewise articulated with the radius. On its inner side it joins the os cuneiforme, and anteriorly, the os magnum and os unciforme.

The os cuneiforme, which is the third bone in the upper row, is compared to a wedge, from its being broader above, at the back of the hand, than it is below. Posteriorly it is articulated with the ulna, and anteriorly with the os unciforme.

These three bones form an oblong articulating surface, covered by cartilage, by which the hand is connected with the fore-arm.

The os pisiforme, or pea-like bone, which is smaller than the three just now described, though generally classed with the bones of the upper row, does not properly belong to either series, being placed on the under surface of the os cuneiforme, so as to project into the palm of the hand. The four bones of the second row correspond with the bones of the thumb and fingers; the first, second, and fourth, are from their shapes named *trapezium*, *trapezoides*, and *unciforme;* the third from its being the largest bone of the carpus, is styled *os magnum*.

All these bones are convex towards the back, and slightly concave towards the palm of the hand; their articulating surfaces are covered with cartilages, and secured by many strong ligaments, particularly by two ligamentous expansions, called the external and internal annular ligaments of the wrist. The former extends in an oblique direction from the os pisiforme to the styloid process of the radius, and is an inch and a half in breadth; the latter or internal annular ligament is stretched from the os pisiforme and os unciforme, to the os scaphoides and trapezium. These annular ligaments likewise serve to bind down the tendons of the wrist and fingers.

55 Of the metacarpus. The metacarpus consists of four bones, which support the fingers; externally they are a little convex, and internally somewhat concave, where they form the palm of the hand. They are hollow, and of a cylindrical shape.

At each extremity they are a little hollowed for their articulation; superiorly with the bones of the carpus, and inferiorly with the first phalanx of the fingers, in the same manner as the several phalanges of the fingers are articulated with each other.

56 Of the fingers. The five fingers of each hand are composed of fifteen bones, disposed in three ranks called phalanges: The bones of the first phalanx, which are articulated with the

(L) The motions of pronation and supination may be easily described. If the palm of the hand, for instance, is placed on the surface of a table, the hand may be said to be in a state of pronation; but if the back part of the hand is turned towards the table, the hand will be then in a state of supination.

Osteology. the metacarpus, are the largeſt, and thoſe of the laſt phalanx the ſmalleſt. All theſe bones are larger at their extremities than in their middle part.

We obſerve at the extremities of the bones of the carpus, metacarpus, and fingers, ſeveral inequalities that ſerve for their articulation with each other; and theſe articulations are ſtrengthened by means of the ligaments which ſurround them.

It will be eaſily underſtood that this multiplicity of bones in the hand (for there are 27 in each hand) is eſſential to the different motions we wiſh to perform. If each finger was compoſed only of one bone inſtead of three, it would be impoſſible for us to graſp any thing.

57. § 2. *Of the* Lower Extremities.

Each lower extremity is divided into four parts, viz. the os femoris, or thigh bone; the rotula, or knee-pan; the leg; and the foot.

1. Of the Thigh.

58 Of the os femoris. The thigh is compoſed only of this bone, which is the largeſt and ſtrongeſt we have. It will be neceſſary to diſtinguiſh its body and extremities: Its body, which is of a cylindrical ſhape, is convex before and concave behind, where it ſerves to lodge ſeveral muſcles. Throughout two-thirds of its length we obſerve a ridge called *linea aſpera*, which originates from the trochanters, and after running for ſome way downwards, divides into two branches, that terminate in the tuberoſities at the lower extremity of the bone.

At its upper extremity we muſt deſcribe the neck and ſmooth head of the bone, and likewiſe two conſiderable proceſſes: The head, which forms the greater portion of a ſphere unequally divided, is turned inwards, and received into the great cotyloid cavity of the os innominatum. At this part of the bone there is a little foſſa to be obſerved, to which the round ligament is attached, and which we have already deſcribed as tending to ſecure the head of this bone in the great acetabulum. The neck is almoſt horizontal conſidered with reſpect to its ſituation with the body of the bone. Of the two proceſſes, the external one, which is the largeſt, is called trochanter major; and the other, which is placed on the inſide of the bone, trochanter minor. They both afford attachment to muſcles. The articulation of the os femoris with the trunk is ſtrengthened by means of a capſular ligament, which adheres every where round the edge of the great cotyloid cavity of the os innominatum, and ſurrounds the head of the bone.

The os femoris moves upon the trunk in every direction.

At the lower extremity of the bone are two proceſſes called the condyles, and an intermediate ſmooth cavity, by means of which it is articulated with the leg by ginglimus.

All round the under end of the bone there is an irregular ſurface where the capſular ligament of the joint has its origin, and where blood-veſſels go into the ſubſtance of the bone.

Between the condyles there is a cavity poſteriorly, in which the blood-veſſels and nerves are placed, ſecure from the compreſſion to which they would otherwiſe be expoſed in the action of bending the leg, and which would not fail to be hurtful.

At the ſide of each condyle externally, there is a tuberoſity, from whence the lateral ligaments originate, which are extended down to the tibia. Osteology.

A ligament likewiſe ariſes from each condyle poſteriorly. One of theſe ligaments paſſes from the right to the left, and the other from the left to the right, ſo that they interſect each other, and for that reaſon are called the *croſs ligaments*.

The lateral ligaments prevent the motion of the leg upon the thigh to the right or left; and the croſs ligaments, which are alſo attached to the tibia, prevent the latter from being brought forwards.

In new-born children all the proceſſes of this bone are cartilaginous.

2. The Rotula, or Knee-pan.

The rotula, patella, or knee-pan, as it is differently called, is a flat bone about four or five inches in circumference, and is placed at the fore-part of the joint of the knee. In its ſhape it is ſomewhat like the common figure of the heart, with its point downwards. 59 Of the rotula.

It is thinner at its edge than in its middle part; at its fore-part it is ſmooth and ſomewhat convex; its poſterior ſurface, which is more unequal, affords an elevation in the middle which is admitted between the two condyles of the os femoris.

This bone is retained in its proper ſituation by a ſtrong ligament which every where ſurrounds it, and adheres both to the tibia and os femoris; it is likewiſe firmly connected with the tibia by means of a ſtrong tendinous ligament of an inch in breadth, and upwards of two inches in length, which adheres to the lower part of the patella, and to the tuberoſity at the upper end of the tibia. On account of this connection, it is very properly conſidered as an appendage to the tibia, which it follows in all its motions, ſo as to be to it what the olecranon is to the ulna. There is this difference, however, that the olecranon is a fixed proceſs; whereas the patella is moveable, being capable of ſliding from above downwards and from below upwards. This mobility is eſſential to the rotatory motion of the leg.

In very young children this bone is entirely cartilaginous.

The principal uſe of the patella ſeems to be to defend the articulation of the knee from external injury; it likewiſe tends to increaſe the power of the extenſor muſcles of the leg, by removing their direction farther from the centre of motion in the manner of a pulley.

3. Of the Leg. 60.

The leg is compoſed of two bones: Of theſe the inner one, which is the largeſt, is called tibia; the other is much ſmaller, and named fibula.

The tibia, which is ſo called from its reſemblance to the muſical pipe of the ancients, has three ſurfaces, and is not very unlike a triangular priſm. Its poſterior ſurface is the broadeſt; anteriorly it has a conſiderable ridge called the ſhin, between which and the ſkin there are no muſcles. At the upper extremity of this bone are two ſurfaces, a little concave, and ſeparated from each other by an intermediate elevation. The two little cavities receive the condyles of the os femoris, and the eminence between them is admitted into the cavity which we ſpoke of as being between the two condyles; ſo that this articulation affords a ſpecimen of the com- 61 Of the tibia.

 plete

 plete ginglimus. Under the external edge of the upper end of this bone is a circular flat ſurface, which receives the head of the fibula.

At the lower and inner portion of the tibia, we obſerve a conſiderable proceſs called *malleolus internus*. The baſis of the bone terminates in a large tranſverſe cavity, by which it is articulated with the uppermoſt bone of the foot. It has likewiſe another cavity at its lower end and outer ſide, which is ſomewhat oblong, and receives the lower end of the fibula.

62 The tibia is hollow through its whole length.

Of the fibula. The fibula is a ſmall long bone ſituated on the outſide of the tibia. Its ſuperior extremity does not reach quite ſo high as the upper part of the tibia, but its lower end deſcends ſomewhat lower. Both above and below, it is articulated with the tibia by means of the lateral cavities we noticed in our deſcription of that bone.

Its lower extremity is ſtretched out into a coronoid proceſs, which is flattened at its inſide, and is convex externally, forming what is called the *malleolus externus*, or *outer ancle*. This is rather lower than the malleolus internus of the tibia.

The body of this bone, which is irregularly triangular, is a little hollow at its internal ſurface, which is turned towards the tibia; and it affords like that bone, through its whole length, attachment to a ligament, which from its ſituation is called the interoſſeous ligament.

63. 4. Of the Foot.

64 The foot conſiſts of the tarſus, metatarſus, and toes.

Of the tarſus. The tarſus is compoſed of ſeven bones, viz. the aſtragalus, os calcis, os naviculare, os cuboides, and three others called cuneiform bones.

65 Of the aſtragalus. The aſtragalus is a large bone with which both the tibia and fibula are articulated. It is the uppermoſt bone of the foot; it has ſeveral ſurfaces to be conſidered; its upper, and ſomewhat poſterior part, which is ſmooth and convex, is admitted into the cavity of the tibia. Its lateral parts are connected with the malleoli of the two bones of the leg; below, it is articulated with the os calcis, and its anterior ſurface is received by the os naviculare. All theſe articulations are ſecured by means of ligaments.

66 Of the os calcis. The os calcis, or calcaneum, which is of a very irregular figure, is the largeſt bone of the foot. Behind, it is formed into a conſiderable tuberoſity called the heel; without this tuberoſity, which ſupports us in an erect poſture, and when we walk, we ſhould be liable to fall backwards.

On the internal ſurface of this bone, we obſerve a conſiderable ſinuoſity, which affords a paſſage to the tendon of a muſcle: and to the poſterior part of the os calcis, a ſtrong tendinous cord called *tendo achillis* (M) is attached, which is formed by the tendons of ſeveral muſcles united together. The articulation of this with the other bones is ſecured by means of ligaments.

67 Of the os naviculare. The os naviculare, or ſcaphoides, (for theſe two terms have the ſame ſignification), is ſo called on account of its reſemblance to a little bark. At its poſterior part, which is concave, it receives the aſtragalus; anteriorly it is articulated with the cuneiform bones, and laterally it is connected with the os cuboides.

68 Of the os cuboides. The os cuboides forms an irregular cube. Poſteriorly it is articulated with the os calcis; anteriorly it ſupports the two laſt bones of the metatarſus, and laterally it joins the third cuneiform bone and the os naviculare.

69 Of the oſſa cuneiformia. Each of the oſſa cuneiformia, which are three in number, reſembles a wedge, and from this ſimilitude their name is derived. They are placed next to the metatarſus by the ſides of each other, and are uſually diſtinguiſhed into *os cuneiforme externum*, *medium* or *minimum*, and *internum* or *maximum*. The ſuperior ſurface of theſe bones, from their wedge-like ſhape, is broader than that which is below, where they help to form the ſole of the foot; poſteriorly they are united to the os naviculare, and anteriorly they ſupport the three firſt metatarſal bones.

When theſe ſeven bones compoſing the tarſus are viewed together in the ſkeleton, they appear convex above, where they help to form the upper part of the foot; and concave underneath, where they form the hollow of the foot, in which the veſſels, tendons, and nerves of the foot are placed ſecure from preſſure.

They are united to each other by very ſtrong ligaments, and their articulation with the foot is ſecured by a capſular and two lateral ligaments; each of the latter is covered by an annular ligament of conſiderable breadth and thickneſs, which ſerves to bind down the tendons of the foot, and at the ſame time to ſtrengthen the articulation.

The os cuneiforme externum is joined laterally to the os cuboides.

Theſe bones complete our account of the tarſus. Though what we have ſaid of this part of the oſteology has been very ſimple and conciſe, yet many readers may not clearly underſtand it; but if they will be pleaſed to view theſe bones in their proper ſituation in the ſkeleton, all that we have ſaid of them will be eaſily underſtood.

70 Of the metatarſus. The metatarſus is made up of five bones, whereas the metacarpus conſiſts only of four. The cauſe of this difference is, that in the hand the laſt bone of the thumb is not included among the metacarpal bones; whereas in the foot the great toe has only two bones. The firſt of theſe bones ſupports the great toe and is much larger than the reſt, which nearly reſemble each other in ſize.

Theſe bones are articulated by one extremity with the cuneiform bones and the os cuboides, and by their other end with the toes.

71 Of the toes. Each of the toes, like the fingers, conſiſts of three bones, except the great toe, which is formed of two bones. Thoſe of the other four are diſtinguiſhed into three phalanges. Although the toes are more confined in their motion than the fingers, yet they appear to be perfectly fitted for the purpoſes they are deſigned for. In walking, the toes bring the centre of gravity perpendicular to the advanced foot; and as the ſoles of the foot are naturally concave, we can at pleaſure increaſe this concavity, and form a kind of vault, which adjuſts itſelf to the different inequalities that occur

(M) This tendon is ſometimes ruptured by jumping, dancing, or other violent efforts.

cur to us in walking; and which, without this mode of arrangement, would incommode us exceedingly, especially when bare-footed.

72. § 4. *Of the Ossa* SESAMOIDEA.

BESIDES the bones we have already described, there are several small ones that are met with only in the adult skeleton, and in persons who are advanced in life; which, from their supposed general resemblance to the seeds of the sesamum, are called *ossa sesamoidea*. They are commonly to be seen at the first joint of the great toe, and sometimes at the joints of the thumb; they are likewise now and then to be found at the lower extremity of the fibula, upon the condyles of the thigh-bone, under the os cuboides of the tarsus, and in other parts of the body. Their size and number seem constantly to be increased by age and hard labour; and as they are generally found in situations where tendons and ligaments are most exposed to the action of muscles, they are now generally considered as ossified portions of ligaments or tendons.

The upper surface of these bones is usually convex, and adherent to the tendon that covers it; the side which is next to the joint is smooth and flat. Though their formation is accidental, yet they seem to be of some use, by raising the tendons farther from the centre of motion, and consequently increasing the power of the muscles. In the great toe and thumb they are likewise useful, by forming a groove for the flexor tendons.

EXPLANATION OF THE PLATES OF OSTEOLOGY.

PLATE XVII.

FIG. 1. A Front-view of the MALE SKELETON.

A, The os frontis. B, The os parietale. C, The coronal suture. D, The squamous part of the temporal bones. E, The squamous suture. F, The zygoma. G, The mastoid process. H, The temporal process of the sphenoid bone. I, The orbit. K, The os malæ. L, The os maxillare superius. M, Its nasal process. N, The ossa nasi. O, The os unguis. P, The maxilla inferior. Q, The teeth, which are sixteen in number in each jaw. R, The seven cervical vertebræ, with their intermediate cartilages. S, Their transverse processes. T, The twelve dorsal vertebræ, with their intermediate cartilages. U, The five lumbar vertebræ. V, Their transverse processes. W, The upper part of the os sacrum. X, Its lateral parts. The holes seen on its fore part are the passages of the undermost spinal nerves and small vessels. Opposite to the holes, the marks of the original divisions of the bone are seen. Y, The os ilium. Z, Its crest or spine. a, The anterior spinous processes. b, The brim of the pelvis. c, The ischiatic niche. d, The os ischium. e, Its tuberosity. f, Its spinous process. g, Its crus. h, The foramen thyroideum. i, The os pubis. k, The symphysis pubis. l, The crus pubis. m, The acetabulum. n, The seventh or last true rib. o, The twelfth or last false rib. p, The upper end of the sternum. q, The middle piece. r, The under end, or cartilage ensiformis. s, The clavicle. t, The internal surface of the scapula. u, Its acromion. v, Its coracoid process. w, Its cervix. x, The glenoid cavity. y, The os humeri. z, Its head, which is connected to the glenoid cavity. 1, Its external tubercle. 2, Its internal tubercle. 3, The groove for lodging the long head of the biceps muscle of the arm. 4, The internal condyle. 5, The external condyle. Between 4 and 5, the trochlea. 6, The radius. 7, Its head. 8, Its tubercle. 9, The ulna. 10, Its coronoid process. 11, 12, 13, 14, 15, 16, 17, 18, The carpus; composed of os naviculare, os lunare, os cuneiforme, os pisiforme, os trapezium, os trapezoides, os magnum, os unciforme. 19, The five bones of the metacarpus. 20, The two bones of the thumb. 21, The three bones of each of the fingers. 22, The os femoris. 23, Its head. 24, Its cervix. 25, The trochanter major. 26, The trochanter minor. 27, The internal condyle. 28, The external condyle. 29, The rotula. 30, The tibia. 31, Its head. 32, Its tubercle. 33, Its spine. 34, The malleolus internus. 35, The fibula. 36, Its head. 37, The malleolus externus. The tarsus is composed of, 38, The astragalus; 39, The os calcis; 40, The os naviculare; 41, Three ossa cuneiformia, and the os cuboides, which is not seen in this figure. 42, The five bones of the metatarsus. 43, The two bones of the great toe. 44, The three bones of each of the small toes.

FIG. 2. A Front-view of the SKULL.

A, The os frontis. B, The lateral part of the os frontis, which gives origin to part of the temporal muscle. C, The superciliary ridge. D, The superciliary hole through which the frontal vessels and nerves pass. EE, The orbitar processes. F, The middle of the transverse suture. G, The upper part of the orbit. H, The foramen opticum. I, The foramen lacerum. K, The inferior orbitar fissure. L, The os unguis. M, The ossa nasi. N, The os maxillare superius. O, Its nasal process. P, The external orbitar hole through which the superior maxillary vessels and nerves pass. Q, The os malæ. R, A passage for small vessels into, or out of, the orbit. S, The under part of the left nostril. T, The septum narium. U, The os spongiosum superius. V, The os spongiosum inferius. W, The edge of the alveoli, or spongy sockets, for the teeth. X, The maxilla inferior. Y, The passage for the inferior maxillary vessels and nerves.

FIG. 3. A Side-view of the SKULL.

A, The os frontis. B, The coronal suture. C, The os parietale. D, An arched ridge which gives origin to the temporal muscle. E, The squamous suture. F, The squamous part of the temporal bone; and, farther forwards, the temporal process of the sphenoid bone. G, The zygomatic process of the temporal bone. H, The zygomatic suture. I, The mastoid process of the temporal bone. K, The meatus auditorius externus. L, The orbitar plate of the frontal bone, under which is seen the transverse suture. M, The pars plana of the ethmoid bone. N, The os unguis. O, The right os nasi. P, The superior maxillary bone. Q, Its nasal process. R, The two dentes incisores. S, The dens caninus. T, The two small molares. U, The three large molares. V, The os malæ. W, The lower jaw. X, Its angle. Y, The coronoid

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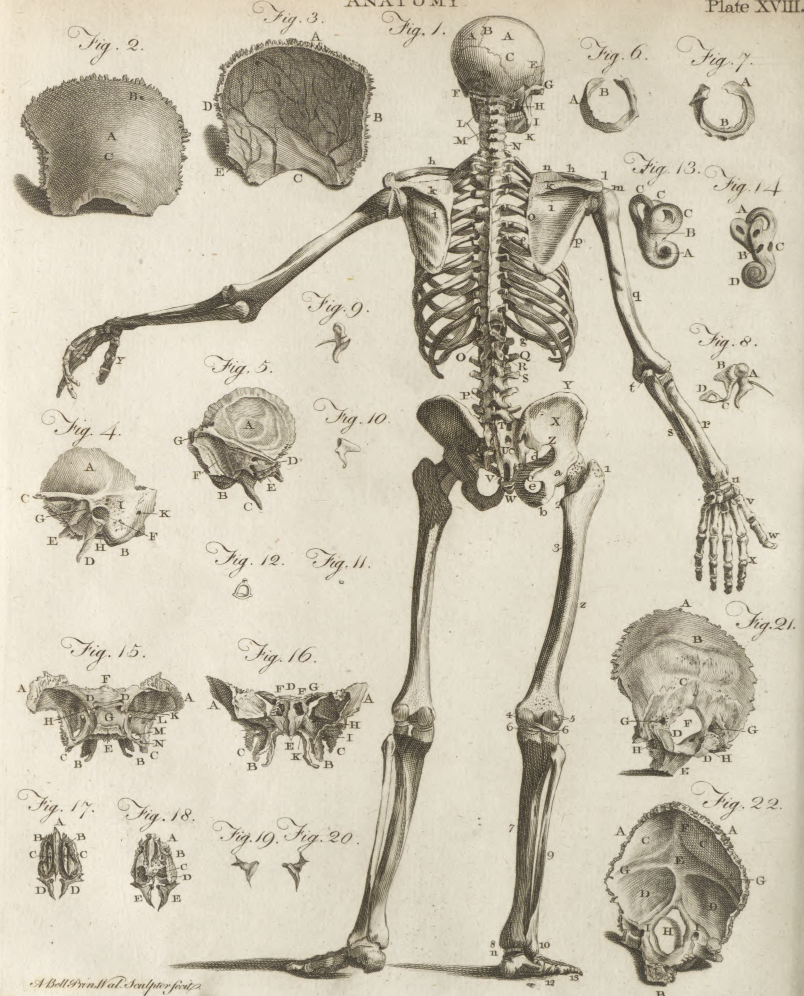

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coronoid procefs. Z, The condyloid procefs, by which the jaw is articulated with the temporal bone.

Fig. 4. The pofterior and right Side of the Skull.

A, The os frontis. B B, The offa parietalia. C, The fagittal future. D, The parietal hole, through which a fmall vein runs to the fuperior longitudinal finus. E, The lambdoid future. F F, Offa triquetra. G, The os occipitis. H, The fquamous part of the temporal bone. I, The maftoid procefs. K, The zygoma. L, The os malæ. M, The temporal part of the fphenoid bone. N, The fuperior maxillary bone and teeth.

Fig. 5. The external Surface of the Os Frontis.

A, The convex part. B, Part of the temporal foffa. C, The external angular procefs. D, The internal angular procefs. E, The nafal procefs. F, The fuperciliary arch. G, The fuperciliary hole. H, The orbitar plate.

Fig. 6. The Internal Surface of the Os Frontis.

A A, The ferrated edge which affifts to form the coronal future. B, The external angular procefs. C, The internal angular procefs. D, The nafal procefs. E, The orbitar plate. F, The cells which correfpond with thofe of the ethmoid bone. G, The paffage from the frontal finus. H, The opening which receives the cribriform plate of the ethmoid bone. I, The cavity which lodges the fore part of the brain. K, The fpine to which the falx is fixed. L, The groove which lodges the fuperior longitudinal finus.

Plate XVIII.

Fig. 1. A Back-view of the Skeleton.

A A, The offa parietalia. B, The fagittal future. C, The lambdoid future. D, The occipital bone. E, The fquamous future. F, The maftoid procefs of the temporal bone. G, The os malæ. H, The palate plates of the fuperior maxillary bones. I, The maxilla inferior. K, The teeth of both jaws. L, The feven cervical vertebræ. M, Their fpinous proceffes. N, Their tranfverfe and oblique proceffes. O, The laft of the twelve dorfal vertebræ. P, The fifth or laft lumbar vertebra. Q, The tranfverfe proceffes. R, The oblique proceffes. S, The fpinous proceffes. T, The upper part of the os facrum. U, The pofterior holes which tranfmit fmall blood-veffels and nerves. V, The under part of the os facrum which is covered by a membrane. W, The os coccygis. X, The os ilium. Y, Its fpine or creft. Z, The ifchiatic niche. a, The os ifchium. b, Its tuberofity. c, Its fpine. d, The os pubis. e, The foramen hydroideum. f, The feventh or laft true rib. g, The twelfth or laft falfe rib. h, The clavicle. i, The fcapula. k, Its fpine. l, Its acromion. m, Its cervix. n, Its fuperior cofta. o, Its pofterior cofta. p, Its inferior cofta. q, The os humeri. r, The radius. s, The ulna. t, Its oleclanon. u, All the bones of the carpus, excepting the os pififorme, which is feen in Plate XVII. fig. 1. v, The five bones of the metacarpus. w, The two bones of the thumb. x, The three bones of each of the fingers. y, The two fifamoid bones at the root of the left thumb. z, The os femoris. 1, The trochanter major. 2, The trochanter minor. 3, The linea afpera. 4, The internal condyle. 5, The external condyle. 6 6, The fimilunar cartilages. 7, The tibia. 8, The malleolus internus. 9, The fibula. 10, The malleolus externus. 11, The tarfus. 12, The metatarfus. 13, The toes.

Fig. 2. The External Surface of the Left Os Parietale.

A, The convex fmooth furface. B, The parietal hole. C, An arch made by the beginning of the temporal mufcle.

Fig. 3. The Internal Surface of the fame bone.

A, Its fuperior edge, which, joined with the other, forms the fagittal future. B, The anterior edge, which affifts in the formation of the coronal future. C, The inferior edge for the fquamous future. D, The pofterior edge for the lambdoid future. E, A depreffion made by the lateral finus. F F, The prints of the arteries of the dura mater.

Fig. 4. The External Surface of the Left Os Temporum.

A, The fquamous part. B, The maftoid procefs. C, The zygomatic procefs. D, The ftyloid procefs. E, The petrofal procefs. F, The meatus auditorius externus. G, The glenoid cavity for the articulation of the lower jaw. H, The foramen ftylo-maftoideum for the portio dura of the feventh pair of nerves. I, Paffages for blood-veffels into the bone. K, The foramen maftoideum through which a vein goes to the lateral finus.

Fig. 5. The Internal Surface of the Left Os Temporum.

A, The fquamous part; the upper edge of which affifts in forming the fquamous future. B, The maftoid procefs. C, The ftyloid procefs. D, The pars petrofa. E, The entry of the feventh pair, or auditory nerve. F, The foffa, which lodges a part of the lateral finus. G, The foramen maftoideum.

Fig. 6. The External Surface of the Osseous Circle which terminates the meatus auditorius externus.

A, The anterior part. B, A fmall part of the groove in which the membrana tympani is fixed.

N. B. This, with the fubfequent bones of the ear, are here delineated as large as the life.

Fig. 7. The Internal Surface of the Osseous Circle.

A, The anterior part. B, The groove in which the membrana tympani is fixed.

Fig. 8. The Situation and Connection of the Small Bones of the Ear.

A, The malleus. B, The incus. C, The os orbiculare. D, The ftapes.

Fig. 9. The Malleus, with its Head, Handle, and Small Proceffes.

Fig. 10. The Incus, with its Body, Superior and Inferior Branches.

Fig. 11. The Os Orbiculare.

Fig. 12. The Stapes, with its Head, Bafe, and two Crura.

Fig. 13. An Internal View of the Labyrinth of the Ear.

A, The hollow part of the cochlea, which forms a fhare

Osteology. ſhare of the meatus auditorius internus. B, The veſtibulum. C C C, The ſemicircular canals.

Fig. 14. An External View of the Labyrinth.

A, the ſemicircular canals. B, The feneſtra ovalis which leads into the veſtibulum. C, The feneſtra rotunda which opens into the cochlea. D, The different turns of the cochlea.

Fig. 15. The Internal Surface of the Os Sphenoides.

A A, The temporal proceſſes. B B, The pterygoid proceſſes. C C, The ſpinous proceſſes. D D, The anterior clinoid proceſſes. E, The poſterior clinoid proceſs. F, The anterior proceſs which joins the ethmoid bone. G, The ſella turcica for lodging the glandula pituitaria. H, The foramen opticum. K, The foramen lacerum. L, The foramen rotundum, M, The foramen ovale. N, The foramen ſpinale.

Fig. 16. The External Surface of the Os Sphenoides.

A A, The temporal proceſſes. B B, The pterygoid proceſſes. C C, The ſpinous proceſſes. D, The proceſſus azygos. E, The ſmall triangular proceſſes which grow from the body of the bone. F F, The orifices of the ſphenoidal ſinuſes. G, The foramen lacerum. H, The foramen rotundum. I, The foramen ovale. K, The foramen pterygoideum.

Fig. 17. The External View of the Os Ethmoides.

A, The naſal lamella. B B, The grooves between the naſal lamella and oſſa ſpongioſa ſuperiora. C C, The oſſa ſpongioſa ſuperiora. D D, The ſphenoidal cornua. See Fig. 16. E.

Fig. 18. The Internal View of the Os Ethmoides.

A, The criſta galli. B, The cribriform plate, with the different paſſages of the olfactory nerves. C C, Some of the ethmoidal cells. D, The right os planum. E E, The ſphenoidal cornua.

Fig. 19. The right Sphenoidal Cornu.

Fig. 20. The left Sphenoidal Cornu.

Fig. 21. The External Surface of the Os Occipitis.

A, The upper part of the bone. B, The ſuperior arched ridge. C, The inferior arched ridge. Under the arches are prints made by muſcles of the neck. D D, The two condyloid proceſſes which articulate the head with the ſpine. E, The cuneiform proceſs. F, The foramen magnum through which the ſpinal marrow paſſes. G G, The poſterior condyloid foramina which tranſmit veins into the lateral ſinuſes. H H, The foramina lingualia for the paſſage of the ninth pair of nerves.

Fig. 22. The Internal Surface of the Os Occipitis.

A A, The two ſides which aſſiſt to form the lambdoid future. B, The point of the cuneiform proceſs where it joins the ſphenoid bone. C C, The prints made by the poſterior lobes of the brain. D D, Prints made by the lobes of the cerebellum. E, The cruciform ridge for the attachment of the proceſſes of the dura mater. F, The courſe of the ſuperior longitudinal ſinuſes. G G, The courſe of the two lateral ſinuſes. H, The foramen magnum. I I, The poſterior condyloid foramina.

Plate XIX.

Fig. 1. A Side-view of the Skeleton.

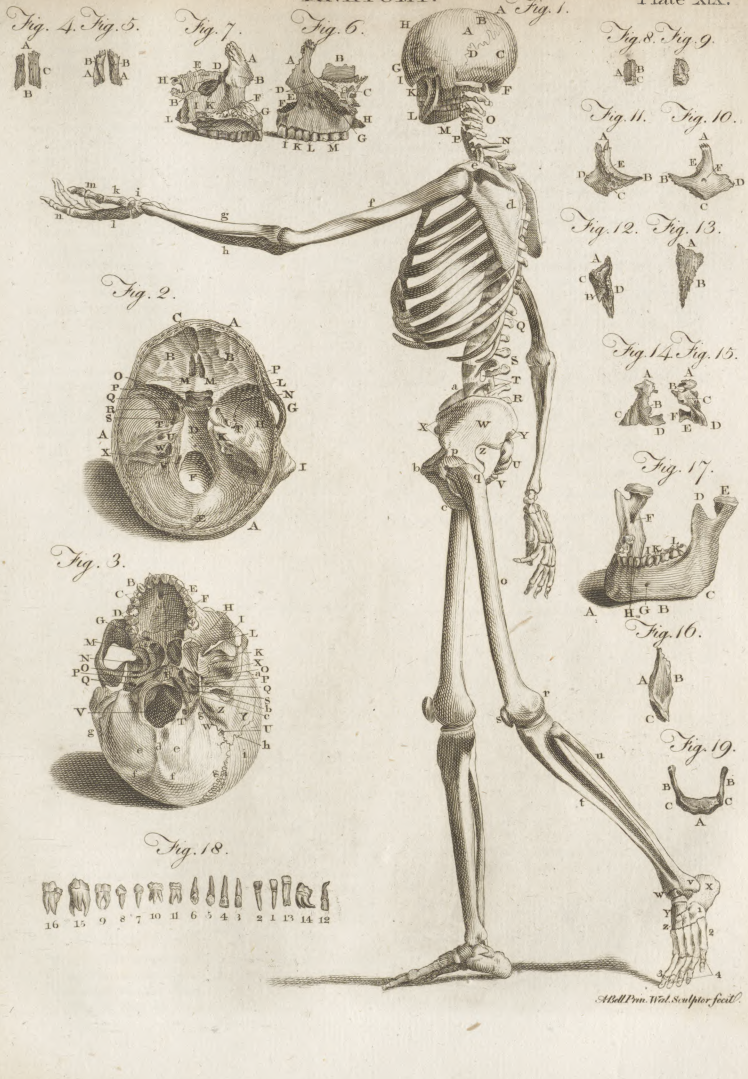
A A, The oſſa parietalia. B, The ſagittal future. C, The os occipitis. D D, The lambdoid future. E, The ſquamous part of the temporal bone. F, The maſtoid proceſs. G, The meatus auditorius externus. H, The os frontis. I, The os malæ. K, The os maxillare ſuperius. L, The maxilla inferior. M, The teeth of both jaws. N, The ſeventh, or laſt cervical vertebra. O, The ſpinous proceſſes. P, Their tranſverſe and oblique proceſſes. Q, The twelfth or laſt dorſal vertebra. R, The fifth, or laſt lumbar vertebra. S, The ſpinous proceſſes. T, Openings between the vertebræ for the paſſage of the ſpinal nerves. U, The under end of the os ſacrum. V, The os coccygis. W, The os ilium. X, The anterior ſpinous proceſſes. Y, The poſterior ſpinous proceſſes. Z, The iſchiatic niche. a, The right os ilium. b, The oſſa pubis. c, The tuberoſity of the left os iſchium. d, The ſcapula. e, Its ſpine. f, The os humeri. g, The radius. h, The ulna. i, The carpus. k, The metacarpal bone of the thumb. l, The metacarpal bones of the fingers. m, The two bones of the thumb. n, The three bones of each of the fingers. o, The os femoris. p, Its head. q, The trochanter major. r, The external condyle. s, The rotula. t, The tibia. u, The fibula. v, The malleolus externus. w, The aſtragalus. x, The os calcis. y, The os naviculare. z, The three oſſa cuneiformia. 1, The os cuboides. 2, The five metatarſal bones. 3, The two bones of the great toe. 4, The three bones of each of the ſmall toes.

Fig. 2. A View of the Internal Surface of the Baſe of the Skull.

A A A, The two tables of the ſkull with the diploë. B B, The orbitar plates of the frontal bone. C, The criſta galli, with cribriform-plate of the æthmoidal bone on each ſide of it, through which the firſt pair of nerves paſs. D, The cuneiform proceſs of the occipital bone. E, The cruciform ridge. F, The foramen magnum for the paſſage of the ſpinal marrow. G, The zygoma, made by the joining of the zygomatic proceſſes of the os temporum and os malæ. H, The pars ſquamoſa of the os temporum. I, The pars mammillaris. K, The pars petroſa. L, The temporal proceſs of the ſphenoid bone. M M, The anterior clinoid proceſſes. N, The poſterior clinoid proceſs. O, The ſella turcica. P, The foramen opticum, for the paſſage of the optic nerve and ocular artery of the left ſide. Q, The foramen lacerum, for the third, fourth, ſixth, and firſt of the fifth pair of nerves and ocular vein. R, The foramen rotundum, for the ſecond of the fifth pair. S, The foramen ovale, for the third of the fifth pair. T, The foramen ſpinale, for the principal artery of the dura mater. U, The entry of the auditory nerve. V, The paſſage for the lateral ſinus. W, The paſſage of the eighth pair of nerves. X, The paſſage of the ninth pair.

Fig. 3. A View of the External Surface of the Baſe of the Skull.

A, The two dentes inciſores of the right ſide. B, The dens caninus. C, The two ſmall molares. D, The three large molares. E, The foramen inciſivum, which gives paſſage to ſmall blood-veſſels and nerves. F, The palate-



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Osteology. palate-plates of the ossa maxillaria and palati, joined by the longitudinal and transverse palate sutures. G, The foramen palatinum posterius, for the palatine vessels and nerves. H, The os maxillare superius of the right side. I, The os malæ. K, The zygomatic process of the temporal bone. L, The posterior extremity of the ossa spongiosa. M, The posterior extremity of the vomer, which forms the back-part of the septum nasi. N, The pterygoid process of the right side of the sphenoid bone. O O, The foramina ovalia. P P, The foramina spinalia. Q Q, The passages of the internal carotid arteries. R, A hole between the point of each pars petrosa and cuneiform process of the occipital bone, which is filled up with a ligamentous substance in the recent subject. S, The passage of the left lateral sinus. T, The posterior condyloid foramen of the left side. U, The foramen mastoideum. V. The foramen magnum. W, The inferior orbitar fissure. X, The glenoid cavity, for the articulation of the lower jaw. Y, The squamous part of the temporal bone. Z, The mastoid process, at the inner side of which is a fossa for the posterior belly of the digastric muscle. a, The styloid process. b, The meatus auditorius externus. c, The left condyle of the occipital bone. d, The perpendicular occipital spine. e e, The inferior horizontal ridge of the occipital bone. f f, The superior horizontal ridge, which is opposite to the crucial ridge where the longitudinal sinus divides to form the lateral sinuses. g g g, The lambdoid suture. h, The left squamous suture. i, The parietal bone.

Fig. 4. The anterior surface of the Ossa Nasi.

A, The upper part, which joins the os frontis. B, The under end, which joins the cartilage of the nose. C, Their inner edge, where they join each other.

Fig. 5. The posterior surface of the Ossa Nasi.

A A, Their cavity, which forms part of the arch of the nose. B B, Their ridge or spine, which projects a little to be fixed to the fore-part of the septum narium.

Fig. 6. The external surface of the Os Maxillare Superius of the left side.

A, The nasal process. B, The orbitar plate. C, The unequal surface which joins the os malæ. D, The external orbitar hole. E, The opening into the nostril. F, The palate-plate. G, The maxillary tuberosity. H, Part of the os palati. I, The two dentes incisores. K, The dens caninus. L, The two small dentes molares. M, The three large dentes molares.

Fig. 7. The internal surface of the Os Maxillare Superius and Os Palati.

A, The nasal process. B B, Eminences for the connection of the os spongiosum inferius. D, The under end of the lacrymal groove. E, The antrum maxillare. F, The nasal spine, between which and B is the cavity of the nostril. G, The palate-plate. H, The orbitar part of the os palati. I, The nasal plate. K, The suture which unites the maxillary and palate bones. L, The pterygoid process of the palate bone.

Fig. 8. The external surface of the right Os Unguis.

A, The orbitar part. B, The lacrymal part. C, The ridge between them.

Fig. 9. The internal surface of the right Os Unguis. Osteology.

This side of the bone has a furrow opposite to the external ridge; all behind this is irregular, where it covers part of the ethmoidal cells.

Fig. 10. The external surface of the left Os Malæ.

A, The superior orbitar process. B, The inferior orbitar process. C, The malar process. D, The zygomatic process. E, The orbitar plate. F, A passage for small vessels into or out of the orbit.

Fig. 11. The internal surface of the left Os Malæ.

A, The superior orbitar process. B, The inferior orbitar process. C, The malar process. D, The zygomatic process. E, The internal orbitar plate or process.

Fig. 12. The external surface of the right Os Spongiosum Inferius.

A, The anterior part. B, The hook-like process for covering part of the antrum maxillare. C, A small process which covers part of the under end of the lacrymal groove. D, The inferior edge turned a little outwards.

Fig. 13. The internal surface of the Os Spongiosum Inferius.

A, The anterior extremity. B, The upper edge which joins the superior maxillary and palate bones.

Fig. 14. The posterior and external surface of the right Os Palati.

A, The orbitar process. B, The nasal lamella. C, The pterygoid process. D, The palate process.

Fig. 15. The anterior and external surface of the right Os Palati.

A, The orbitar process. B, An opening through which the lateral nasal vessels and nerves pass. C, The nasal lamella. D, The pterygoid process. E, The posterior edge of the palate process for the connection of the velum palati. F, The inner edge by which the two ossa palati are connected.

Fig. 16. The right side of the Vomer.

A, The upper edge which joins the nasal lamella of the ethmoid bone and the middle cartilage of the nose. B, The inferior edge which is connected to the superior maxillary and palate bones. C, The superior and posterior part which receives the processus azygos of the sphenoid bone.

Fig. 17. The Maxilla Inferior.

A, The chin. B, The base and left side. C, The angle. D, The coronoid process. E, The condyloid process. F, The beginning of the inferior maxillary canal of the right side, for the entry of the nerve and blood-vessels. G, The termination of the left canal. H, The two dentes incisores. I, The dens caninus. K, The two small molares. L, The three large molares.

Fig. 18. The different classes of the Teeth.

1, 2, A fore and back view of the two anterior dentes incisores of the lower jaw. 3, 4, Similar teeth of the upper jaw. 5, 6, A fore and back view of the dentes canini. 7, 8, The anterior dentes molares. 9, 10, 11, The posterior dentes molares. 12, 13, 14,

15,

Osteology. 15, 16, Unusual appearances in the shape and size of the teeth.

Fig. 19. The external surface of the Os Hyoides.

A, The body. B B, The cornua. C C, The appendices.

Plate XX.

Fig. 1. A Posterior View of the Sternum and Clavicles, with the ligament connecting the clavicles to each other.

a, The posterior surface of the sternum. b b, The broken ends of the clavicles. c c c c, The tubercles near the extremity of each clavicle. d, The ligament connecting the clavicles.

Fig. 2. A Fore-view of the Left Scapula, and of a half of the Clavicle, with their Ligaments.

a, The spine of the scapula. b, The acromion. c, The inferior angle. d, Inferior costa. e, Cervix. f, Glenoid cavity, covered with cartilage for the arm-bone. g g, The capsular ligament of the joint. h, Coracoid process. i, The broken end of the clavicle. k, Its extremity joined to the acromion. l, A ligament coming out single from the acromion to the coracoid process. m, A ligament coming out single from the acromion, and dividing into two, which are fixed to the coracoid process.

Fig. 3. The Joint of the Elbow of the Left Arm, with the Ligaments.

a, The os humeri. b, Its internal condyle. c c, The two prominent parts of its trochlea appearing through the capsular ligament. d, The ulna. e, The radius. f, The part of the ligament including the head of the radius.

Fig. 4. The Bones of the Right-hand, with the Palm in view.

a, The radius. b, The ulna. c, The scaphoid bone of the carpus. d, The os lunare. e, The os cuneiforme. f, The os pisiforme. g, Trapesium, h, Trapesoides. i, Capitatum. k, Unciforme. l, The four metacarpal bones of the fingers. m, The first phalanx. n, The second phalanx. o, The third phalanx. p, The metacarpal bone of the thumb. q, The first joint. r, the second joint.

Fig. 5. The Posterior View of the Bones of the Left Hand.

The explication of Fig. 4. serves for this figure; the same letters pointing out the same bones, though in a different view.

Fig. 6. The Upper Extremity of the Tibia, with the Semilunar Cartilages of the Joint of the Knee, and some Ligaments.

a, The strong ligament which connects the rotula to the tubercle of the tibia. b b, The parts of the extremity of the tibia, covered with cartilage, which appear within the semilunar cartilages. c c, The semilunar cartilages. d, The two parts of what is called the cross ligament.

Fig. 7. The Posterior View of the Joint of the Right Knee.

a, The os femoris cut. b, Its internal condyle. c, Its external condyle. d, The back-part of the tibia. e, The superior extremity of the fibula. f, The edge of the internal semilunar cartilage. g, An oblique ligament. h, A larger perpendicular ligament. i, A ligament connecting the femur and fibula.

Fig. 8. The Anterior View of the Joint of the Right Knee.

b, The internal condyle. c, Its external condyle. d, The part of the os femoris, on which the patella moves. e, A perpendicular ligament. f f, The two parts of the crucial ligaments. g g, The edges of the two moveable semilunar cartilages. h, The tibia. i, The strong ligament of the patella. k, The back part of it where the fat has been dissected away. l, The external depression. m, The internal one. n, The cut tibia.

Fig. 9. A View of the Inferior Part of the Bones of the Right Foot.

a, The great knob of the os calcis. b, A prominence on its outside. c, The hollow for the tendons, nerves, and blood-vessels. d, The anterior extremity of the os calcis. e, Part of the astragalus. f, Its head covered with cartilage. g, The internal prominence of the os naviculare. h, The os cuboides. i, The os cuneiforme internum; k,—Medium; l,—Externum. m, The metatarsal bones of the four lesser toes. n, The first—o, The second—p, The third phalanx of the four lesser toes. q, The metatarsal bones of the great toe. r, Its first—s, Its second joint.

Fig. 10. The Inferior Surface of the two large Sesamoid Bones, at the first Joint of the Great Toe.

Fig. 11. The Superior View of the Bones of the Right Foot.

a, b, as in Fig. 9. c, The superior head of the astragalus. d, &c. as in Fig. 9.

Fig. 12. The View of the Sole of the Foot, with its Ligaments.

a, The great knob of the os calcis. b, The hollow for the tendons, nerves, and blood-vessels. c, The sheaths of the flexores pollicis and digitorum longi opened. d, The strong cartilaginous ligament supporting the head of the astragalus. e, h, Two ligaments which unite into one, and are fixed to the metatarsal bone of the great toe. f, A ligament from the knob of the os calcis to the metatarsal bone of the little toe. g, A strong triangular ligament, which supports the bones of the tarsus. i, The ligaments of the joints of the five metatarsal bones.

Fig. 13. a, The head of the thigh bone of a child. b, The ligamentum rotundum connecting it to the acetabulum. c, The capsular ligament of the joint with its arteries injected. d, The numerous vessels of the mucilaginous gland injected.

Fig. 14. The Back-view of the Cartilages of the Larynx, with the Os Hyoides.

a, The posterior part of the base of the os hyoides. b b, Its cornua. c, The appendix of the right side. d, A ligament sent out from the appendix of the left side, to the styloid process of the temporal bone. e, The union of the base with the left cornu. f f, The posterior sides of (g) the thyroid cartilage. h h, Its superior

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Osteology. superior cornua. i i, Its inferior cornua. k, The cricoid cartilage. l l, The arytenoid cartilages. m, The entry into the lungs, named *glottis*. n, The epiglottis. o o, The superior cartilages of the trachea. p, Its ligamentous back-part.

FIG. 15. The Superior Concave Surface of the SESAMOID BONES at the first joint of the Great Toe, with their Ligaments. Osteology.

a, Three sesamoid bones. b, The ligamentous substance in which they are formed.

PART II. OF THE SOFT PARTS IN GENERAL; OF THE COMMON INTEGUMENTS, WITH THEIR APPENDAGES; AND OF THE MUSCLES.

73. ANATOMICAL writers usually proceed to a description of the muscles after having finished the osteology; but we shall deviate a little from the common method, with a view to describe every thing clearly and distinctly, and to avoid a tautology which would otherwise be unavoidable. All the parts of the body are so intimately connected with each other, that it seems impossible to convey a just idea of any one of them, without being in some measure obliged to say something of others; and on this account we wish to mention in this place the names and situation of the principal viscera of the body, that when mention is hereafter made of any one of them in the course of the work, the reader may at least know where they are placed.

After this little digression, the common integuments, and after them the muscles, will be described; we then propose to enter into an examination of the several viscera and their different functions. In describing the brain, occasion will be taken to speak of the nerves and animal spirits. The circulation of the blood will follow the anatomy of the heart, and the secretions and other matters will be introduced in their proper places.

The body is divided into three great cavities. Of these the uppermost is formed by the bones of the cranium, and incloses the brain and cerebellum.

The second is composed of the vertebræ of the back, the sternum, and true ribs, with the additional assistance of muscles, membranes, and common integuments, and is called the *thorax*—It contains the heart and lungs.

The third, and inferior cavity, is the abdomen. It is separated from the thorax by means of the diaphragm, and is formed by the lumbar vertebræ, the os sacrum, the ossa innominata, and the false ribs, to which we may add the peritonæum, and a variety of muscles. This cavity incloses the stomach, intestines, omentum or cawl, liver, pancreas, spleen, kidneys, urinary bladder, and parts of generation.

Under the division of common integuments, are usually included the epidermis, or scarf-skin, the reticulum mucosum of Malpighi, the cutis or true skin, and the membrana adiposa.—The hair and nails, as well as the sebaceous glands, may be considered as appendages to the skin.

SECT. I. *Of the* SKIN.

§ 1. *Of the* SCARF-*skin*.

74 Cuticula. THE epidermis, cuticula, or scaf-skin, is a fine, transparent, and insensible pellicle, destitute of nerves and blood-vessels, which invests the body, and everywhere covers the true skin. This scarf-skin, which seems to be very simple, appears, when examined with a microscope, to be composed of several laminæ or scales which are increased by pressure, as we may observe in the hands and feet, where it is frequently much thickened, and becomes perfectly callous. It seems to adhere to the cutis by a number of very minute filaments, but may easily be separated from it by heat, or by maceration in water. Some anatomical writers have supposed that it is formed by a moisture exhaled from the whole surface of the body, which gradually hardens when it comes into contact with the air. They were perhaps induced to adopt this opinion, by observing the speedy regeneration of this part of the body when it has been by any means destroyed, it appearing to be renewed on all parts of the surface at the same time; whereas other parts which have been injured, are found to direct their growth from their circumference only towards their centre. But a demonstrative proof that the epidermis is not a fluid hardened by means of the external air, is, that the fœtus in utero is found to have this covering. Leeuwenhoeck supposed its formation to be owing to the expansion of the extremities of the excretory vessels, which are found everywhere upon the surface of the true skin. Ruysch attributed its origin to the nervous papillæ of the skin; and Heister thinks it probable, that it may be owing both to the papillæ and the excretory vessels. The celebrated Morgagni, on the other hand, contends *, that it is nothing more than the surface of the cutis, hardened and rendered insensible by the liquor amnii in utero, and by the pressure of the air. This is a subject, however, on which we can advance nothing with certainty.

* Adversar. Anat. II. Animadver. 2.

The cuticle is pierced with an infinite number of pores, or little holes, which afford a passage to the hairs, sweat, and insensible perspiration, and likewise to warm water, mercury, and whatever else is capable of being taken in by the absorbents of the skin. The lines which we observe on the epidermis belong to the true skin. The cuticle adjusts itself to them, but does not form them.

§ 2. *Of the Rete Mucosum.*

BETWEEN the epidermis and cutis we meet with an appearance to which Malpighi, who first described it, gave the name of *rete mucosum*, supposing it to be of a membranous structure, and pierced with an infinite number of pores; but the fact is, that it seems to be nothing more than a mucous substance which may be dissolved by macerating it in water, while the cuticle and cutis preserve their texture. 75 Rete mucosum.

The

The colour of the body is found to depend on the colour of this rete mucoſum; for in negroes it is obſerved to be perfectly black, whilſt the true ſkin is of the ordinary colour.

The bliſters which raiſe the ſkin when burnt or ſcalded, have been ſuppoſed by ſome to be owing to a rarefaction of this mucus; but they are more probably occaſioned by an increaſed action of the veſſels of the part, together with an afflux and effuſion of the thinner parts of the blood.

§ 3. *Of the* Cutis, *or True Skin.*

76 Cutis. The cutis is compoſed of fibres cloſely compacted together, as we may obſerve in leather which is the prepared ſkin of animals. Theſe fibres form a thick network, which everywhere admits the filaments of nerves, and an infinite number of blood-veſſels and lymphatics.

The cutis, when the epidermis is taken off, is found to have, throughout its whole ſurface, innumerable papillæ, which appear like very minute granulations, and ſeem to be calculated to receive the impreſſions of the touch, being the moſt eaſily obſerved where the ſenſe of feeling is the moſt delicate, as in the palms of the hands and on the fingers.

Theſe papillæ are ſuppoſed by many anatomical writers to be continuations of the pulpy ſubſtance of nerves, whoſe coats have terminated in the cellular texture of the ſkin. The great ſenſibility of theſe papillæ evidently proves them to be exceedingly nervous; but ſurely the nervous fibrillæ of the ſkin are of themſelves ſcarcely equal to the formation of theſe papillæ, and it ſeems to be more probable that they are formed like the reſt of the cutis.

Theſe papillæ being deſcribed, the uſes of the epidermis and the reticulum mucoſum will be more eaſily underſtood; the latter ſerving to keep them conſtantly moiſt, while the former protects them from the external air, and modifies their too great ſenſibility.

§ 4. *Of the* Glands *of the Skin.*

77 The ſebaceous glands. In different parts of the body we meet, within the ſubſtance of the ſkin, with certain glands or follicles, which diſcharge a fat and oily humour that ſerves to lubricate and ſoften the ſkin. When the fluid they ſecrete has acquired a certain degree of thickneſs, it approaches to the colour and conſiſtence of ſuet; and from this appearance they have derived their name of *ſebaceous glands*. They are found in the greateſt number in the noſe, ear, nipple, axilla, groin, ſcrotum, vagina, and prepuce.

Beſides theſe ſebaceous glands, we read, in anatomical books, of others that are deſcribed as ſmall ſpherical bodies placed in all parts of the ſkin, in much greater abundance than thoſe juſt now mentioned, and named *miliary*, from their ſuppoſed reſemblance to millet-ſeed. Steno, who firſt deſcribed theſe glands, and Malpighi, Ruyſch, Verheyen, Winſlow, and others, who have adopted his opinions on this ſubject, ſpeak of them as having excretory ducts, that open on the ſurface of the cuticle, and diſtil the ſweat and matter of inſenſible perſpiration; and yet, notwithſtanding the poſitive manner in which theſe pretended glands have been ſpoken of, we are now ſufficiently convinced that their exiſtence is altogether imaginary.

§ 5. *Of the* Insensible *Perſpiration and* Sweat.

The matter of inſenſible perſpiration, or in other words, the ſubtile vapour that is continually exhaling from the ſurface of the body, is not ſecreted by any particular glands, but ſeems to be derived wholly from the extremities of the minute arteries that are everywhere diſperſed through the ſkin. Theſe exhaling veſſels are eaſily demonſtrated in the dead ſubject, by throwing water into the arteries; for then ſmall drops exſude from all parts of the ſkin, and raiſe up the cuticle, the pores of which are cloſed by death; and in the living ſubject, a looking-glaſs placed againſt the ſkin, is ſoon obſcured by the vapour. Bidloo fancied he had diſcovered ducts leading from the cutis to the cuticle, and tranſmitting this fluid; but in this he was miſtaken. 78 Inſenſible perſpiration.

When the perſpiration is by any means increaſed, and ſeveral drops that were inſenſible when ſeparate, are united together and condenſed by the external air, they form upon the ſkin ſmall but viſible drops called *ſweat* (N). This particularly happens after much exerciſe, or whatever occaſions an increaſed determination of fluids to the ſurface of the body; a greater quantity of perſpirable matter being in ſuch caſes carried thro' the paſſages that are deſtined to convey it off.

It has been diſputed, indeed, whether the inſenſible perſpiration and ſweat are to be conſidered as one and the ſame excretion, differing only in degree; or whether they are two diſtinct excretions derived from different ſources. In ſupport of the latter opinion, it has been alleged, that the inſenſible perſpiration is agreeable to nature and eſſential to health, whereas ſweat may be conſidered as a ſpecies of diſeaſe. But this argument proves nothing; and it ſeems probable, that both the inſenſible vapour and the ſweat are exhaled in a ſimilar manner, though they differ in quantity, and probably in their qualities; the former being more limpid, and ſeemingly leſs impregnated with ſalts than the latter: at any rate we may conſider the ſkin as an emunctory through which the redundant water, and ſometimes the other more ſaline parts of the blood, are carried off. But the inſenſible perſpiration is not confined to the ſkin only—a great part of what we are conſtantly throwing off in this way is from the lungs. The quantity of fluid exhaled from the human body by this inſenſible perſpiration is very conſiderable. Sanctorius (o) an Italian phyſician, who indefatigably paſſed a great many 79 Whether theſe are one and the ſame or different excretions. 80 Their uſes.

(N) Leeuwenhoeck aſſerts, that one drop of ſweat is formed by the conflux of 15 drops of perſpirable vapour.

(o) The inſenſible perſpiration is ſometimes diſtinguiſhed by the name of this phyſician, who was born in the territories of Venice, and was afterwards a profeſſor in the univerſity of Padua. After eſtimating the aliment he took in, and the ſenſible ſecretions and diſcharges, he was enabled to aſcertain with great accuracy the weight or quantity of inſenſible perſpiration by means of a ſtatical chair which he contrived for this purpoſe; and

Of the Integuments, &c.

many years in a series of statical experiments, demonstrated long ago what has been confirmed by later observations, that the quantity of vapour exhaled from the skin and from the surface of the lungs, amounts nearly to 5-8ths of the aliment we take in. So that if in the warm climate of Italy a person eats and drinks the quantity of eight pounds in the course of a day, five pounds of it will pass off by insensible perspiration, while three pounds only will be evacuated by stool, urine, saliva, &c. But in countries where the degree of cold is greater than in Italy, the quantity of perspired matter is less; in some of the more northern climates, it being found not to equal the discharge by urine. It is likewise observed to vary according to the season of the year, and according to the constitution, age, sex, diseases, diet, exercise, passions, &c. of different people.

From what has been said on this subject, it will be easily conceived, that this evacuation cannot be either much increased or diminished in quantity without affecting the health.

The perspirable matter and the sweat are in some measure analogous to the urine, as appears from their taste and saline nature (P). And it is worthy of observation, that when either of these secretions is increased in quantity, the other is diminished; so that they who perspire the least, usually pass the greatest quantity of urine, and vice versa.

§ 6. *Of the* Nails.

81 The nails.

The nails are of a compact texture, hard and transparent like horn. Their origin is still a subject of dispute. Malpighi supposed them to be formed by a continuation of the papillæ of the skin: Ludwig, on the other hand, maintained, that they were composed of the extremities of blood-vessels and nerves; both these opinions are now deservedly rejected.

They seem to possess many properties in common with the cuticle; like it they are neither vascular nor sensible, and when the cuticle is separated from the true skin by maceration or other means, the nails come away with it.

They appear to be composed of different layers, of unequal size, applied one over the other. Each layer seems to be formed of longitudinal fibres.

In each nail we may distinguish three parts, viz. the root, the body or middle, and the extremity. The root is a soft, thin, and white substance, terminating in the form of a crescent; the epidermis adheres very strongly to this part; the body of the nail is broader, redder, and thicker, and the extremity is of still greater firmness.

The nails increase from their roots, and not from their upper extremity.

Their principal use is to cover and defend the ends of the fingers and toes from external injury.

§ 7. *Of the* Hair.

The hairs, which from their being generally known do not seem to require any definition, arise from distinct capsules or bulbs seated in the cellular membrane under the skin (Q). Some of these bulbs inclose several hairs. They may be observed at the roots of the hairs which form the beard or whiskers of a cat. 82 The hair.

The hairs, like the nails, grow only from below by a regular propulsion from their root, where they receive their nourishment. Their bulbs, when viewed with a microscope, are found to be of various shapes. In the head and scrotum they are roundish; in the eyebrows they are oval; in the other parts of the body they are nearly of a cylindrical shape. Each bulb seems to consist of two membranes, between which there is a certain quantity of moisture. Within the bulb the hair separates into three or four fibrillæ; the bodies of the hairs, which are the parts without the skin, vary in softness and colour according to the difference of climate, age, or temperament of body (R).

Their general use in the body does not seem to be absolutely determined; but hairs in particular parts, as on the eye-brows and eye-lids, are destined for particular uses, which will be mentioned when those parts are described.

§ 8. *Of the* Cellular Membrane *and* Fat.

The cellular membrane is found to invest the most minute fibres we are able to trace; so that by modern physiologists, it is very properly considered as the universal connecting medium of every part of the body. 83 Cellular membrane.

It is composed of an infinite number of minute cells united together, and communicating with each other. The two diseases peculiar to this membrane are proofs of such a communication; for in the *emphysema* all its cells are filled with air, and in the anasarca they are universally distended with water. Besides these proofs of communication from disease, a familiar instance of it may be observed amongst butchers, who usually puncture this membrane, and by inflating it with air add to the good appearance of their meat.

 The

and from his experiments which were conducted with great industry and patience, he was led to determine what kinds of solid or liquid aliment increased or diminished it. From these experiments he formed a system, which he published at Venice in 1614, in the form of aphorisms, under the title of "Ars de Medicina Statica."

(P) Minute crystals have been observed to shoot upon the cloaths of men who work in glass-houses. *Haller. Elem. Phys.*

(Q) Malpighi, and after him the celebrated Ruysch, supposed the hairs to be continuations of nerves, being of opinion that they originated from the papillæ of the skin, which they considered as nervous; and as a corroborating proof of what they advanced, they argued the pain we feel in plucking them out; but later anatomists seem to have rejected this doctrine, and consider the hairs as particular bodies, not arising from the papillæ (for in the parts where the papillæ abound most there are no hairs), but from bulbs or capsules, which are peculiar to them.

(R) The hairs likewise differ from each other, and may not be improperly divided into two classes; one of which may include the hair of the head, chin, pubes, and axillæ; and the other, the softer hairs, which are to be observed almost everywhere on the surface of the body.

84

Fat.

The cells of this membrane ſerve as reſervoirs to the oily part of the blood or *Fat*, which ſeems to be depoſited in them, either by tranſudation through the coats of the arteries that ramify through theſe cells, or by particular veſſels, continued from the end of arteries. Theſe cells are not of a glandular ſtructure, as Malpighi and others after him have ſuppoſed. The fat is abſorbed and carried back into the ſyſtem by the lymphatics. The great waſte of it in many diſeaſes, particularly in the conſumption, is a ſufficient proof that ſuch an abſorption takes place.

The fulneſs and ſize of the body are in a great meaſure proportioned to the quantity of fat contained in the cells of this membrane.

In the living body it ſeems to be a fluid oil, which concretes after death. In graminivorous animals, it is found to be of a firmer conſiſtence than in man.

The fat is not confined to the ſkin alone, being met with every where in the interſtices of muſcles, in the omentum, about the kidneys, at the baſis of the heart, in the orbits, &c.

The chief uſes of the fat ſeem to be to afford moiſture to all the parts with which it is connected; to facilitate the action of the muſcels; and to add to the beauty of the body, by making it every where ſmooth and equal.

Sect. II. *Of the* Muscles.

85. The muſcles are the organs of motion. The parts that are uſually included under this name conſiſt of diſtinct portions of fleſh, ſuſceptible of contraction and relaxation; the motions of which, in a natural and healthy ſtate, are ſubject to the will, and for this reaſon they are called *voluntary* muſcles. But beſides theſe, there are other parts of the body that owe their power of contraction to their muſcular fibres; thus the heart is of a muſcular texture, forming what is called a *hollow* muſcle; and the urinary bladder, ſtomach, inteſtines, &c. are enabled to act upon their contents, merely becauſe they are provided with muſcular fibres. Theſe are called *involuntary* muſcles, becauſe their motions are not dependent on the will. The muſcles of reſpiration, being in ſome meaſure influenced by the will, are ſaid to have a *mixed* motion.

The names by which the voluntary muſcles are diſtinguiſhed, are founded on their ſize, figure, ſituation, uſe, or the arrangement of their fibres, or their origin and inſertion. But beſides theſe particular diſtinctions, there are certain general ones that require to be noticed. Thus, if the fibres of a muſcle are placed parallel to each other in a ſtraight direction, they form what is ſtyled a *rectilinear* muſcle; if the fibres croſs and interſect each other, they conſtitute a *compound* muſcle; a *radiated* one, if the fibres are diſpoſed in the manner of rays; or a *penniform* muſcle, if, like the plume of a pen, they are placed obliquely with reſpect to the tendon.

Muſcles that act in oppoſition to each other, are called *antagoniſtæ;* thus every extenſor or muſcle has a flexor for its antagoniſt, and *vice verſa*. Muſcles that concur in the ſame action are ſtyled *congeneres*.

The muſcles being attached to the bones, the latter may be conſidered as levers that are moved in different directions by the contraction of thoſe organs.

That end of a muſcle which adheres to the moſt fixed part is uſually called the *origin*, and that which adheres to the more moveable part the *inſertion*, of the muſcle.

In every muſcle we may diſtinguiſh two kinds of fibres; the one ſoft, of a red colour, ſenſible, and irritable, called *fleſhy* fibres; the other of a firmer texture, of a white gliſtening colour, inſenſible, without irritability or the power of contracting, and named tendinous fibres. They are occaſionally intermixed; but the fleſhy fibres generally prevail in the belly or middle part of a muſcle, and the tendinous ones in the extremities. If theſe tendinous fibres are formed into a round ſlender chord, they form what is called the *tendon* of the muſcle; on the other hand, if they are ſpread into a broad flat ſurface, the extremity of the muſcle is ſtyled *aponeuroſis*

The tendons of many muſcles, eſpecially when they are long and expoſed to preſſure or friction in the grooves formed for them in the bones, are ſurrounded by a tendinous ſheath or *faſcia*, in which we ſometimes find a ſmall mucous ſac or *burſa mucoſa*, which obviates any inconvenience from friction. Sometimes we find whole muſcles, and even ſeveral muſcles, covered by a faſcia of the ſame kind, that affords origin to many of their fibres, dipping down between them, adhering to the ridges of bones, and thus preventing them from ſwelling too much when in action. The moſt remarkable inſtance of ſuch a covering is the *faſcia lata* of the thigh.

Each muſcle is incloſed by a thin covering of cellular membrane, which has been ſometimes improperly conſidered as peculiar to the muſcles, and deſcribed under the name of *propria membrana muſculoſa*. This cellular covering dips down into the ſubſtance of the muſcle, connecting and ſurrounding the moſt minute fibres we are able to demonſtrate, and affording a ſupport to their veſſels and nerves.

Leeuwenhoek fancied he had diſcovered, by means of his microſcope, the ultimate diviſion of a muſcle, and that he could point out the ſimple fibre, which appeared to him to be an hundred times leſs than a hair; but he was afterwards convinced how much he was miſtaken on this ſubject, and candidly acknowledged, that what he had taken for a ſimple fibre was in fact a bundle of fibres.

It is eaſy to obſerve ſeveral of theſe faſciculi or bundles in a piece of beef, in which, from the coarſeneſs of its texture, they are very evident.

The red colour which ſo particularly diſtinguiſhes the muſcular or fleſhy parts of animals, is owing to an infinite number of blood-veſſels that are diſperſed through their ſubſtance. When we macerate the fibres of a muſcle in water, it becomes of a white colour like all other parts of the body diveſted of their blood. The blood-veſſels are accompanied by nerves, and they are both diſtributed in ſuch abundance to theſe parts, that in endeavouring to trace the courſe of the blood-veſſels in a muſcle, it would appear to be formed altogether by their ramifications; and in an attempt to follow the branches of its nerves, they would be found to be equal in proportion.

If a muſcle is pricked or irritated, it immediately contracts. This is called its irritable principle; and this

Of the Muſcles.

this irritability is to be conſidered as the characteriſtic of muſcular fibres, and may ſerve to prove their exiſtence in parts that are too minute to be examined by the eye. This power, which diſpoſes the muſcles to contract when ſtimulated, independent of the will, is ſuppoſed to be inherent in them; and is therefore named *vis inſita*. This property is not to be confounded with elaſticity, which the membranes and other parts of the body poſſeſs in a greater or leſs degree in common with the muſcles; nor with ſenſibility, for the heart, though the moſt irritable, ſeems to be the leaſt ſenſible of any of the muſcular parts of the body.

86 Of the vis inſita.

After a muſcular fibre has contracted, it ſoon returns to a ſtate of relaxation, till it is excited afreſh, and then it contracts and relaxes again. We may likewiſe produce ſuch a contraction, by irritating the nerve leading to a muſcle, although the nerve itſelf is not affected.

This principle is found to be greater in ſmall than in large, and in young than in old, animals.

In the voluntary muſcles theſe effects of contraction and relaxation of the fleſhy fibres are produced in obedience to the will, by what may be called the *vis nervoſa*, a property that is not to be confounded with the *vis inſita*. As the exiſtence of a *vis inſita* different from a *vis nervea*, was the doctrine taught by Doctor Haller in his *Elem. Phyſ.* but is at preſent called in queſtion by ſeveral, particularly Doctor Monro, we think it neceſſary to give a few objections, as ſtated in his Obſervations on the Nervous Syſtem:

87 The vis nervea.

"The chief experiment (ſays the Doctor) which ſeems to have led Dr Haller to this opinion, is the well-known one, that the heart and other muſcles, after being detached from the brain, continue to act ſpontaneouſly, or by ſtimuli may be rouſed into action for a conſiderable length of time; and when it cannot be alledged, ſays Dr Haller, that the nervous fluid is by the mind, or otherwiſe, impelled into the muſcle.

"That in this inſtance, we cannot comprehend by what power the nervous fluid or energy can be put in motion, muſt perhaps be granted: But has Dr Haller given a better explanation of the manner in which his ſuppoſed vis inſita becomes active?

"If it be as difficult to point out the cauſe of the action of the vis inſita as that of the action of the vis nervea, the admiſſion of that new power, inſtead of relieving, would add to our perplexity.

"We ſhould then have admitted, that two cauſes of a different nature were capable of producing exactly the ſame effect; which is not in general agreeable to the laws of nature.

"We ſhould find other conſequences ariſe from ſuch an hypotheſis, which tend to weaken the credibility of it. For inſtance, if in a ſound animal the vis nervea alone produces the contraction of the muſcles, we will aſk what purpoſe the vis inſita ſerves? If both operate, are we to ſuppoſe that the vis nervea, impelled by the mind or living principle, gives the order, which the vis inſita executes, and that the nerves are the internuntii; and ſo admit two wiſe agents employed in every the moſt ſimple action? But inſtead of ſpeculating farther, let us learn the effect of experiments, and endeavour from theſe to draw plain concluſions.

"1. When I poured a ſolution of opium in water under the ſkin of the leg of a frog, the muſcles, to the ſurface of which it was applied, were very ſoon deprived of the power of contraction. In like manner, when I poured this ſolution into the cavity of the heart, by opening the vena cava, the heart was almoſt inſtantly deprived of its power of motion, whether the experiment was performed on it fixed in its place, or cut out of the body.

"2. I opened the thorax of a living frog; and then tied or cut its aorta, ſo as to put a ſtop to the circulation of its blood.

"I then opened the vena cava, and poured the ſolution of opium into the heart; and found, not only that this organ was inſtantly deprived of its powers of action, but that in a few minutes the moſt diſtant muſcles of the limbs were extremely weakened. Yet this weakneſs was not owing to the want of circulation, for the frog could jump about for more than an hour after the heart was cut out.

"In the firſt of theſe two experiments, we obſerve the ſuppoſed vis inſita deſtroyed by the opium; in the latter, the vis nervea; for it is evident that the limbs were affected by the ſympathy of the brain, and of the nervous ſyſtem in general, with the nerves of the heart.

"3. When the nerve of any muſcle is firſt divided by a tranſverſe ſection, and then burnt with a hot iron, or punctured with a needle, the muſcle in which it terminates contracts violently, exactly in the ſame manner as when the irritation is applied to the fibres of the muſcle. But when the hot iron, or needle, is confined to the nerve, Dr Haller himſelf muſt have admitted, that the vis nervea, and not the vis inſita, was excited. But here I would aſk two queſtions.

"Firſt, Whether we do not as well underſtand how the vis nervea is excited when irritation is applied to the muſcle as when it is applied to the trunk of the nerve, the impelling power of the mind ſeeming to be equally wanting in both caſes?

"Secondly, If it appears that irritation applied to the trunk of a nerve excites the vis nervea, why ſhould we doubt that it can equally well excite it when applied to the ſmall and very ſenſible branches and terminations of the nerve in the muſcle?

"As, therefore, it appears that the ſuppoſed vis inſita is deſtroyed or excited by the ſame means as the vis nervea; nay, that when, by the application of opium to the heart of a frog, after the aorta is cut and the circulation interrupted, we have deſtroyed the vis inſita, the vis nervea is ſo much extinguiſhed, that the animal cannot act with the diſtant muſcles of the limb; and that theſe afterward grow very torpid, or loſe much of their ſuppoſed vis inſita; it ſeems clearly to follow, that there is no juſt ground for ſuppoſing that any other principle produces the contraction of a muſcle."

The *vis nervoſa*, or operation of the mind, if we may ſo call it, by which a muſcle is brought into contraction, is not inherent in the muſcle like the *vis inſita*; neither is it perpetual, like this latter property. After long continued or violent exerciſe, for example, the

Of the Integuments, &c.

the voluntary muscles become painful, and at length incapable of further action; whereas the heart and other involuntary muscles, the motions of which depend solely on the *vis insita*, continue through life in a constant state of action, without any inconvenience or waste of this inherent principle.

The action of the vis nervosa on the voluntary muscles, constitutes what is called *muscular motion;* a subject that has given rise to a variety of hypotheses, many of them ingenious, but none of them satisfactory.

Borelli and some others have undertaken to explain the cause of contraction, by supposing that every muscular fibre forms as it were a chain of very minute bladders, while the nerves which are distributed through the muscle, bring with them a supply of animal spirits, which at our will fill these bladders, and by increasing their diameter in width, shorten them, and of course the whole fibre.

Borelli supposes these bladders to be of a rhomboidal shape; Bernouilli on the other hand contends that they are oval. Our countryman, Cowper, fancied he had filled them with mercury; the cause of this mistake was probably owing to the mercury's insinuating itself into some of the lymphatic vessels. The late ingenious Mr Elliot undertook to account for the phenomena of muscular motion on principles very different from those just now mentioned. He supposed that a dephlogisticated state of the blood is requisite for muscular action, and that a communication of phlogiston to the blood is a necessary effect of such action.

We know that the muscular fibre is shortened, and that the muscle itself swells when in action; but how these phænomena are produced, we are unable to determine. We likewise know that the nerves are essential to muscular motion; for upon dividing or making a ligature round the nerve leading to a muscle, the latter becomes incapable of motion. A ligature made on the artery of a muscle produces a similar effect: a proof this, that a regular supply of blood is also equally necessary to muscular motion. The cause of palsy is usually not to be sought for in the muscle affected, but in the nerve leading to that muscle, or in that part of the brain or spinal marrow from which the nerve derives its origin.

Of the particular Muscles.

As the enumeration and description of the particular muscles must be dry and unentertaining to the generality of readers, yet cannot be altogether omitted in a work of this nature, it appeared eligible to throw this part of the subject into the form of a table; in which the name, origin, insertion, and principal use of each muscle, will be found described in few words, and occasionally its etymology when it is of Greek derivation or difficult to be understood.

A TABLE of the MUSCLES, arranged according to their SITUATION.

[*N. B.* This table does not include all the muscles of the body; those belonging to the eyes, internal ear, intestinum rectum, and the male and female organs of generation, being described in other parts of the work. The reader will be pleased to observe likewise, that although all the muscles (a few only excepted) are in pairs, mention is here made only of the muscles of one side.

	Name.	*Origin.*	*Insertion.*	*Use.*
MUSCLES situated under the integuments of the cranium - -	1. Occipito frontalis.	From the transverse ridge of the os occipitis.	Into the skin of the eye-brows.	To pull the skin of the head backwards, and to raise the eye-brows and skin of the forehead.
	2. Corrugator supercilii.	From above the joining of the os frontis, os nasi, and os maxillare.	Into the inner part of the occipito-frontalis.	To draw the eye-brows towards each other, and to wrinkle the forehead.
——— of the eye-lids - -	1. Orbicularis palpebrarum.	From around the edge of the orbit.	Into the nasal process of the os maxillare.	To shut the eye.
	2. Levator palpebræ superioris.	From the bottom of the orbit, near the optic foramen.	Into the cartilage of the upper eye-lid.	To open the eye.
MUSCLES of the external ear -	1. Attolens auriculam.	From the tendon of the occipito frontalis near the os temporis.	Into the upper part of the ear.	To raise the ear.
	2. Anterior auriculæ.	From near the back part of the zygoma.	Into an eminence behind the helix.	To raise this eminence, and to pull it forwards.

3. RE-

Of the Muscles.

	Name.	Origin.	Insertion.	Use.
	3. Retrahentes (s) auriculæ.	From the outer and back part of the root of the mastoid process.	Into the convex part of the concha.	To stretch the concha, and pull the ear backwards.
MUSCLES of the cartilages of the ear	1. Tragicus.	From the outer and middle part of the concha, near the tragus.	Into the upper part of the tragus.	To depress the concha, and pull the point of the tragus a little outwards.
	2. Anti-tragicus.	From the root of the inner part of the helix.	Into the upper part of the anti-tragus.	To dilate the mouth of the concha.
	3. Transversus-auriculæ.	From the upper part of the concha.	Into the inner part of the helix.	To stretch the concha and scapha, and likewise to pull the parts it is connected with towards each other.
	4. Helicis major.	From the upper, anterior, and acute part of the helix.	Into the cartilage of the helix, a little above the tragus.	To depress the upper part of the helix.
	5. Helicis minor.	From the lower and fore part of the helix.	Into the helix, near the fissure in its cartilage.	To contract the fissure.
——— of the nose,	1. Compressor (T) naris.	From the outer part of the root of the ala nasi.	Into the nasal process of the os maxillare, and anterior extremity of the os nasi.	To straighten the nostrils, and likewise to corrugate the skin of the nose.
——— of the mouth and lips,	1. Levator labii superioris, alæque nasi.	From the outer part of the orbitar process of the os maxillare, and from the nasal process of that bone, where it joins the os frontis.	Into the upper lip and ala of the nose.	To draw the upper lip and skin of the nose upwards and outwards.
	2. Levator anguli oris.	From the os maxillare superius, between the orbitar foramen and the first dens molaris.	Into the orbicularis oris at the angle of the mouth.	To raise the corner of the mouth.
	3. Zygomaticus major.	From the os malæ, near the zygomatic suture.	Into the angle of the mouth.	To raise the angle of the mouth, and make the cheek prominent as in laughing.
	4. Zygomaticus minor.	Immediately above the origin of the zyg. major.	Into the angle of the mouth.	To raise the angle of the mouth obliquely outwards.
	5. Buccinator.	From the alveoli of the dentes molares in the upper and lower jaws.	Into the angle of the mouth.	To contract the mouth and draw the angle of it outwards and backwards.
	6. Depressor labii superioris, alæque nasi.	From the os maxill. super. immediately above the gums of the dentes incisores.	Into the root of the ala nasi and upper lip.	To draw the ala nasi and upper lip downwards.

(s) These are three small slender muscles. The inferior one is sometimes wanting.
(T) The nose is affected by fibres of the occipito frontalis, and by several muscles of the face; but this pair, the compressores, is the only one that is proper to it.

	Name.	Origin.	Inſertion.	Uſe.
	7. Depreſſor anguli oris.	At the ſide of the chin from the lower edge of the maxilla inferior.	Into the angle of the mouth.	To draw the corner of the mouth downwards.
	8. Depreſſor labii inferioris.	From the lower and anterior part of the maxilla inferior.	Into the under lip.	To draw the under lip downwards and ſomewhat outwards
	9. Levator labii inferioris.	From near the gums of the inciſores and caninus of the maxilla inferior.	Into the under lip and ſkin of the chin.	To raiſe the under lip and ſkin of the chin.
	10. Orbicularis Oris (u).			To ſhut the mouth by conſtringing the lips.
Muscles of the lower jaw, - -	1. Temporalis.	From part of the os bregmatis and os frontis; ſquamous part of the os temporis; back part of the os malæ, and the temporal proceſs of the os ſphenoides (v).	Into the coronoid proceſs of the lower jaw.	To move the lower jaw upwards.
	2. Maſſeter (w).	From the malar proceſs of the os maxillare, and the lower edges of the os malæ, and of the zygomatic proceſs of the os temporis.	Into the baſis of the coronoid proceſs, and that part of the jaw which ſupports that and the condyloid proceſs.	To raiſe and likewiſe to move the jaw a little forwards and backwards.
	3. Pterygoideus internus.	From the inner ſurface of the outer wing of the pterygoid proceſs of the os ſphenoides, and from the proceſs of the os palati that helps to form the pterygoid foſſa.	Into the lower jaw on its inner ſide and near its angle.	To raiſe the lower jaw, and draw it a little to one ſide.
	4. Pterygoideus externus.	From the external ala of the pterygoid proceſs, a ſmall part of the adjacent os maxillare, and a ridge in the temporal proceſs of the os ſphenoides.	Into the fore part of the condyloid proceſs of the lower jaw, and likewiſe of the capſular ligament.	To move the jaw forwards and to the oppoſite ſide (x); and at the ſame time to prevent the ligament of the joint from being pinched.
—— ſituated at the fore part of the neck, - -	1. Latiſſimus colli (y).	From the cellular membrane covering	Into the ſide of the chin and integu-	To draw the cheeks and ſkin of the face

(u) This muſcle is in a great meaſure, if not wholly, formed by the buccinator, zygomatici, depreſſores, and other muſcles that move the lips. Its fibres ſurround the mouth like a ring.

(v) Some of its fibres likewiſe have their origin from a ſtrong faſcia that covers the muſcle and adheres to the bone round the whole circumference of its origin. When we remove this covering, we find the muſcle of a ſemicircular ſhape with its radiated fibres, converging and forming a ſtrong middle tendon.

(w) So called from its uſe in chewing, its derivation being from μασισαομαι, *manduco*, "to eat."

(x) This happens when the muſcle acts ſingly. When both act, the jaw is brought horizontally forwards.

(y) This broad and thin muſcular expanſion, which is ſituated immediately under the common integuments, is by Winſlow named *muſculus cutaneus*. Galen gave it the name of πλατυσμα μυωδης (*Platyſma-myoides*); the etymology of which is from πλατυσμος, *dilatatio*, and μυς, *muſculus*, and ειδος, *forma*.

	Name.	Origin.	Insertion.	Use.
		the pectoral, deltoid, and trapezius muscles.	ments of the cheek.	downwards; and when the mouth is shut, to draw all that part of the skin to which it is connected below the lower jaw upwards.
	2. Mastoideus (z).	From the upper part of the sternum, and from the upper and fore part of the clavicle.	Into the mastoid process, and as far back as the lambdoidal suture.	To move the head to one side, or when both muscles act, to bend it forwards.
Muscles situated between the trunk and the os hyoides,	1. Omo-hyoideus (A).	From the upper costa of the scapula near its niche; from part of a ligament that extends across this niche, and sometimes by a few fibres, from the coracoid process.	Into the basis of the os hyoides.	To draw the os hyoides in an oblique direction downwards.
	2. Sterno-hyoideus.	From the cartilage of the first rib, the inner and upper part of the sternum, and a small part of the clavicle	Into the basis of the os hyoides.	To draw the os hyoides downwards.
	3. Hyo-thyroideus.	From part of the basis and horn of the os hyoides.	Into a rough oblique line at the side of the thyroid cartilage.	To raise the thyroid cartilage, or depress the os hyoides.
	4. Sterno-thyroideus.	From between the cartilages of the 1st and 2d ribs, at the upper and inner part of the sternum.	Immediately under the hyo-thyroideus.	To pull the thyroid cartilage downwards.
	5. Cricothyroideus.	From the anterior part and side of the cricoid cartilage.	Into the lower part and inferior horn of the thyroid cartilage.	To pull the cricoid cartilage upwards and backwards, or the thyroid forwards and downwards.
——— situated between the os hyoides and lower jaw,	1. Diagastricus (B).	From a fossa at the root of the mastoid process, and likewise from the os hyoides.	Into the lower and anterior part of the chin.	To draw the lower jaw downwards.
	2. Stylo-hyoideus (C).	From the basis of the styloid process.	Into the side and fore part of the os hyoides near its base.	To draw the os hyoides obliquely upwards.

 3. Mylo-

(z) This, on account of its two origins, is by Albinus described as two distinct muscles, which he names *sterno-mastoideus* and *cleido-mastoideus*.

(A) As this muscle does not always arise from the coracoid process, it seems to have been improperly named *coraco-hyoides* by Douglas and Albinus. Winslow calls it *omo-hyoideus*, on account of its general origin from the scapula.

(B) From δις and γαστηρ (*biventer*), because it has two fleshy bellies with a midddle tendon. This tendon passes through the stylo-hyoideus.

(C) In some subjects we meet with another muscle, which from its having nearly the same origin, insertion, and used as this, has been named *stylo-hoideus alter*.

	Name.	Origin	Insertion.	Use.
	3. Mylo-hyoideus (D).	From the inside of the lower jaw, between the last dens molaris and the chin.	Into the basis of the os hyoides.	To move the os hyoides to either side, forwards or upwards.
	4. (E) Geno-hyoideus.	From the inside of the chin.	Into the base of the os hyoides.	To move the os hyoides forwards or upwards.
	5. Genio-glossus.	From the inside of the chin.	Into the tongue and basis of the os hyoides.	To move the tongue in various directions.
	6. Hyo-glossus (F).	From the horn, basis, and appendix of the os hyoides.	Into the tongue laterally.	To draw the tongue downwards and inwards.
	7. Lingualis.	Laterally from the root of the tongue.	Into the extremity of the tongue.	To shorten the tongue and draw it backwards.
	8. Stylo-glossus.	From the styloid process, and sometimes also from a ligament that extends from thence to the angle of the lower jaw.	Into the side of the tongue from the root to near its tip.	To move the tongue backwards and to one side.
	9. Stylo-pharyngæus.	From the basis of the styloid process.	Into the side of the pharynx and posterior part of the thyroid cartilage.	To raise the thyroid cartilage and pharynx, and likewise to dilate the latter.
	10. Circumflexus-palati.	From near the bony part of the Eustachian tube, and from the spinous process of the os sphenoides.	Into the semilunar edge of the os palati and the velum pendulum palati (G).	To dilate and draw the velum obliquely downwards.
	11. Levator palati.	From the membranous part of the Eustachian tube, and the extremity of the os petrosum.	Into the velum pendulum palati.	To pull the velum backwards.
Muscles situated about the fauces,	1. Palato-pharyngæus.	From the lower and anterior part of the cartilaginous extremity of the Eustachian tube (H); the tendinous expansion of the circumflexus palati; and the velum pendulum palati near the basis and back part of the uvula.	Into the upper and posterior part of the thyroid cartilage.	To raise the pharynx and thyroid cartilage, or to pull the velum and uvula backwards and downwards.

2. Constrictor.

(D) So named from its arising near the dentes molares (μυλοι), and its being inserted into the os hyoides.

(E) From γενειον, *mentum*, "the chin."

(F) From κερας, *cornu*, and γλωσσα, *lingua*, "the tongue."

(G) This muscle in its course forms a round tendon, which, after passing over a kind of hook formed by the inner plate of the pterygoid process of the sphenoid bone, expands into a tendinous membrane.

(H) The few fibres that arise from the Eustachian tube are described as a distinct muscle by Albinus, under the name of *salpingo-pharyngeus*. They serve to dilate the mouth of the tube.

Name.	Origin.	Insertion.	Use.
2. Constrictor isthmi faucium.	From near the basis of the tongue laterally.	Into the velum pendulum palati, near the basis and fore part of the uvula.	To raise the tongue and draw the velum towards it (I).
3. Azygos uvulæ.	From the end of the suture that unites the ossa palati.	Into the extremity of the uvula.	To shorten the uvula, and bring it forwards and upwards.

Muscles at the back part of the pharynx

Name.	Origin.	Insertion.	Use.
1. Constrictor pharyngis superior.	From the cuneiform process of the occipital bone; the pterygoid process of the os sphenoides, and from each jaw near the last dens molaris (K).	Into the middle of the pharynx.	To move the pharynx upwards and forwards, and to compress its upper part.
2. Constrictor pharyngis medius (L).	From the horn and appendix of the os hyoides, and from the ligament that unites it with the thyroid cartilage.	Into the middle of the processus cuneiformis of the occipital bone, about its middle and before the great foramen.	To draw the os hyoides and pharynx upwards, and to compress the latter.
3. Constrictor pharyngis inferior (M).	From the cricoid and thyroid cartilages.	Into the middle of the pharynx.	To compress part of the pharynx.

——— about the glottis - - -

Name.	Origin.	Insertion.	Use.
1. Crico-arytænoideus lateralis.	From the side of the cricoid cartilage.	Into the basis of the arytænoid cartilage laterally.	To open the glottis.
2. Crico-arytænoideus posticus.	From the cricoid cartilage posteriorly.	Into the basis of the arytænoid cartilage posteriorly.	To open the glottis.
3. Arytænoideus obliquus.	From the basis of one of the arytænoid cartilages.	Near the extremity of the other arytænoid cartilage.	To draw the parts it is connected with towards each other.
4. Arytænoideus transversus.	From one of the arytænoid cartilages laterally.	Into the other arytænoid cartilage laterally.	To shut the glottis.
5. Thyreo-arytænoideus.	From the posterior and under part of the thyroid cartilage.	Into the arytænoid cartilage.	To draw the arytænoid cartilage forwards.
6. Arytæno-epiglottideus.	From the upper part of the arytænoid cartilage laterally.	Into the side of the epiglottis.	To move the epiglottis outwards.
7. Thyreo-epiglottideus.	From the thyroid cartilage.	Into the side of the epiglottis.	To pull the epiglottis obliquely downwards (N.)

Muscles

(I) This muscle, and the palato-pharyngæus, likewise serve to close the passage into the fauces, and to carry the food into the pharynx.

(K) The three orders of fibres here mentioned, with a few others derived from the tongue, have given occasion to Douglas to describe them as four distinct muscles, under the names of *cephalo-pharyngæus*, *mylo-pharyngæus ptery-pharyngæus*, and *glosso-pharyngæus*.

(L) Douglas makes two muscles of this, the *hyo-pharyngæus* and *syndesmo-pharyngæus*.

(M) The crico-pharyngæus and thyro-pharyngæus of Douglas.

(N) When either this or the preceding muscle acts with its fellow, the epiglottis is drawn directly downwards upon the glottis.

Muscles	Name.	Origin.	Insertion.	Use.
Muscles at the fore part of the neck, close to the vertebræ - - - -	1. Rectus capitis internus major.	From the anterior extremities of the transverse processes of the five lowermost cervical vertebræ.	Into the fore part of the cuneiform process of the os occipitis.	To bend the head forwards.
	2. Rectus capitis internus minor.	From the anterior and upper part of the first cervical vertebra.	Near the basis of the condyloid process of the os occipitis.	To assist the last described muscle.
	3. Rectus capitis lateralis.	From the anterior and upper part of the transverse process of the first cervical vertebra.	Into the os occipitis, opposite to the stylo-mastoid foramen.	To move the head to one side.
	4. Longus colli.	Within the thorax, laterally from the bodies of the three uppermost dorsal vertebræ; from the basis and fore part of the transverse processes of the first and second dorsal vertebræ, and of the last cervical vertebra; and lastly, from the anterior extremities of the transverse processes of the 6th, 5th, 4th, and 3d cervical vertebræ.	Into the second cervical vertebra anteriorly.	To pull the neck to one side (o).
——— at the fore part of the abdomen - - - -	1. Obliquus externus.	From the lower edges of the eight inferior ribs, near their cartilages.	Into the linea alba (P), ossa pubis (Q), and spine of the ilium (R).	To compress and support the viscera, assist in evacuating the feces and urine, draw down the ribs, and bend the trunk forwards, or obliquely to one side.
	2. Obliquus internus.	From the spinous process of the three lowermost lumbar	Into the cartilages of all the false ribs, linea alba (S), and	To assist the obliquus externus.

(o) When both muscles act, the neck is drawn directly forwards.

(P) The linea alba is that tendinous expansion which reaches from the cartilago ensiformis to the os pubis. It is formed by the interlacement of the tendinous fibres of the oblique and transverse muscles, and on this account some anatomists have considered these as three digastric muscles.

(Q) A little above the pubis the tendinous fibres of this muscle separate from each other, so as to form an opening called the *ring* of the obliquus externus, and commonly, though improperly, the ring of the abdominal muscles, there being no such aperture either in the transversalis or obliquus internus. This ring in the male subject affords a passage to the spermatic vessels, and in the female to the round ligament of the uterus.

(R) From the anterior and upper spinous process of the ilium, this muscle is stretched tendinous to the os pubis, and thus forms what is called by some *Fallopius's*, and by others *Poupart's ligament*. The blood-vessels pass under it to the thigh.

(S) The tendon formed by the upper part of this muscle in its way to the linea alba is divided into two layers. The posterior layer runs under, and the anterior one over, the rectus muscle.

	Name.	Origin.	Insertion.	Use.
		vertebræ, the back part of the os facrum, the fpine of the ilium, and back part of Fallopius's ligament (T).	fore part of the pubis.	
	3. Tranfverfalis.	From the cartilages of the feven inferior ribs; the tranfverfe proceffes of the laft dorfal, and four upper lumbar vertebræ; the inner part of Fallopius's ligament and the fpine of the ilium.	Into the linea alba and cartilago enfiformis.	To comprefs the abdominal vifcera.
	4. Rectus abdominis.	From the upper edge of the pubis and the fymphyfis pubis.	Into the cartilages of the 5th, 6th, and 7th ribs, and the edge of the cartilago enfiformis(U).	To comprefs the fore part of the abdomen, and to bend the trunk forwards.
	5. Pyramidalis (V).	From the anterior and upper part of the pubis.	Into the linea alba and inner edge of the rectus, commonly about two inches above the pubis.	To affift the lower portion of the rectus.
Muscles at the fore part of the thorax -	1. Pectoralis Major.	From the cartilaginous ends of the 5th and 6th ribs; the fternum, and anterior part of the clavicle.	Into the upper and inner part of the os humeri (W).	To draw the arm forwards, or obliquely forwards.
	2. Subclavius.	From the cartilage of the firft rib.	Into the under furface of the clavicle.	To move the clavicle forwards and downwards, and to affift in raifing the firft rib.
	3. Pectoralis minor (X).	From the upper edges of the 3d, 4th, and 5th ribs.	Into the coracoid procefs of the fcapula.	To move the fcapula forwards and downwards, or to elevate the ribs.
	4. Serratus Magnus.	From the eight fuperior ribs.	Into the bafis of the fcapula.	To bring the fcapula forwards.

Muscles

(T) From this part it detaches fome fibres which extend downwards upon the fpermatic chord, and form what is defcribed as the cremafter mufcle.

(U) The fibres of the rectus are generally divided by three tendinous interfections. The two upper thirds of this mufcle paffing between the tendinous layers of the obliquus internus, are inclofed as it were in a fheath; but at its lower part we find it immediately contiguous to the peritonæum, the inferior portion of the tendon of the tranfverfalis paffing over the rectus, and adhering to the anterior layer of the obliquus internus.

(V) This mufcle is fometimes wanting.

(W) The fibres of this mufcle pafs towards the axilla in a folding manner, and with thofe of the latiffimus dorfi form the arm-pit.

(X) This and fome other mufcles derive their name of *ferratus*, from their arifing by a number of tendinous or flefhy digitations, refembling the teeth of a faw (*ferra*).

Of the Muscles.

	Name.	Origin.	Insertion.	Use.
Muscles that concur in forming the thorax, -	1. Diaphragma (Y).			
	2. Levatores costarum.	From the transverse processes of the last cervical, and the eleven upper dorsal vertebræ.	Into the upper side of each rib, near its tuberosity.	To move the ribs upwards and outwards.
	3. Intercostales externi.	From the lower edge of each upper rib.	Into the superior edge of each lower rib.	To elevate the ribs.
	4. Intercostales interni (A).			
	5. Sterno-costales (B).	From the cartilago ensiformis, and lower and middle part of the sternum.	Into the cartilages of the 2d, 3d, 4th, 5th, and 6th ribs.	To depress the cartilages of the ribs.
——— at the back part of the neck and trunk, -	1. Trapezius (C), or cucullaris.	From the middle of the os occipitis, and the spinous processes of the two inferior cervical, and of all the dorsal vertebræ (D).	Into the posterior half of the clavicle, part of the acromion, and the spine of the scapula.	To move the scapula.
	2. Rhomboideus (E).	From the spinous processes of the three lowermost cervical, and of all the dorsal vertebræ.	Into the basis of the scapula.	To move the scapula upwards and backwards.
	3. Latissimus dorsi.	From part of the spine of the os ilium, the spinous processes of the os sacrum and lumbar vertebræ, and of six or eight of the dor-	Into the os humeri, at the inner edge of the groove for lodging the long head of the biceps muscle.	To draw the os humeri downwards and backwards, and to roll it upon its axis.

N° 18

(Y) For a description of the diaphragm, see Part IV. Sect. IV.

(A) The origin, insertion, and use of the internal intercostals, are similar to those of the external. The reader, however, will be pleased to observe, that the intercostales externi occupy the spaces between the ribs only from the spine to their cartilages; from thence to the sternum, their being only a thin membrane, which is spread over the intercostales interni; and that the latter, on the contrary, extend only from the sternum to the angles of each rib.

The fibres of the external muscles run obliquely forwards; those of the internal obliquely backwards. This difference in the direction of their fibres induced Galen to suppose that they were intended for different uses; that the external intercostals, for instance, serve to elevate, and the internal ones to depress the ribs. Fallopius seems to have been the first who ventured to dispute the truth of this doctrine, which has since been revived by Boyle, and more lately still by Hamberger, whose theoretical arguments on this subject have been clearly refuted by the experiments of Haller.

(B) These consist of four, and sometimes five distinct muscles on each side. Vesalius, and after him Douglas and Albinus, consider them as forming a single muscle, which, on account of its shape, they name *triangularis*. Verheyen, Winslow, and Haller, more properly describe them as so many separate muscles, which, on account of their origin and insertion, they name *sterno-costales*.

(C) So named by Riolanus, from τραπεζα, on account of its quadrilateral shape. Columbus and others give it the name of *cucullaris*, from its resemblance to a monk's hood.

(D) The tendinous fibres of this muscle, united with those of its fellow in the nape of the neck, from what is called the *ligamentum colli*.

(E) This muscle consists of two distinct portions, which are described as separate muscles by Albinus, under the names of *rhomboideus minor* and *rhamboideus major*.

I

Name.	Origin.	Insertion.	Use
	sal vertebræ; also from the four inferior false ribs near their cartilages.		
4. Serratus inferior posticus.	From the spinous processes of the two lowermost dorsal, and of three of the lumbar vertebræ.	Into the lower edges of the three or four lowermost ribs near their cartilages.	To draw the ribs outwards, downwards, and backwards.
5. Levator scapulæ.	From the transverse processes of the four uppermost vertebræ colli.	Into the upper angle of the scapula.	To move the scapula forwards and upwards.
6. Serratus superior Posticus.	From the lower part of the ligamentum colli, the spinous process of the lowermost cervical vertebra, and of the two superior dorsal vertebræ.	Into the 2d, 3d, and 4th ribs.	To expand the thorax.
7. Splenius (F).	From the spinous processes of the four or five uppermost vertebræ of the back, and of the lowermost cervical vertebra.	Into the transverse processes of the two first cervical vertebræ, the upper and back part of the mastoid process, and a ridge on the os occipitis.	To move the head backwards.
8. Complexus (G).	From the transverse processes of the four or five uppermost dorsal, and of the six lowermost cervical vertebræ.	Into the os occipitis.	To draw the head backwards.
9. Trachelo-mastoideus (H).	From the transverse processes of the first dorsal vertebra, and four or five of the lowermost cervical vertebræ.	Into the mastoid process.	To draw the head backwards.
10. Rectus capitis posticus major.	From the spinous process of the second cervical vertebra.	Into the os occipitis.	To extend the head and draw it backwards.
11. Rectus capitis posticus minor.	From the first vertebra of the neck.	Into the os occiptis.	To assist the rectus major.
12. Obliquus superior capitis.	From the transverse process of the first cervical vertebra.	Into the os occipitis.	To draw the head backwards.
13. Obliquus inferior capitis.	From the spinous process of the second cervical vertebra.	Into the transverse process of the first cervical vertebra.	To draw the face towards the shoulder, and to move the first vertebra upon the second.

(F) According to some writers, this muscle has gotten its name from its resemblance to the spleen; others derive it from *splenium splint*.

(G) So named on account of its complicated stricture.

(H) So named from its origin from the neck (τραχηλος) and its insertion into the mastoid process.

Name.	Origin.	Infertion.	Ufe.
14. Sacro-lumbalis (I).	From the back part of the os facrum, fpine of the ilium, fpinous proceffes, and roots of the tranfverfe proceffes of the vertebræ of the loins.	Into the lower edge of each rib.	To draw the ribs downwards, move the body upon its axis, affift in erecting the trunk, and turn the neck backwards, or to one fide.
15. Longiffimus dorfi (K).	The fame as that of the facro-lumbalis.	Into the tranfverfe proceffes of the dorfal vertebræ.	To ftretch the vertebræ of the back, and keep the trunk erect.
16. Spinalis dorfi.	From the fpinous proceffes of the uppermoft lumbar and lowermoft dorfal vertebræ.	Into the fpinous proceffes of the nine fuperior dorfal vertebræ.	To extend the vertebræ.
17. Semi-fpinalis dorfi.	From the tranfverfe proceffes of the 7th, 8th, 9th, and 10th vertebræ of the back.	Into the fpinous proceffes of the four uppermoft dorfal, and lowermoft of the cervical vertebræ.	To extend the fpine obliquely backwards.
18. Multifidus Spinæ (L).	From the os facrum, ilium, oblique and tranfverfe proceffes of the lumbar vertebræ, tranfverfe proceffes of the dorfal, and four of the cervical vertebræ.	Into the fpinous proceffes of the lumbar, dorfal, and fix of the cervical vertebræ.	To extend the back and draw it backwards, or to one fide.
19. Semi-fpinalis colli.	From the tranfverfe proceffes of the five or fix uppermoft dorfal vertebræ.	Into the fpinous proceffes of the 2d, 3d, 4th, 5th, and 6th cervical vertebræ.	To ftretch the neck obliquely backwards.
20. Scalenus (M).	From the tranfverfe proceffes of the five inferior cervical vertebræ.	Into the upper and outer part of the firft and fecond ribs.	To move the neck forwards, or to one fide.

21. Inter-

(I) Several thin fafciculi of flefhy fibres arife from the lower ribs, and terminate in the inner fide of this mufcle. Steno names them *mufculi ad facro lumbalem acceffori.* The facro lumbalis likewife fends off a flefhy flip from its upper part, which by Douglas and Albinus is defcribed as a diftinct mufcle, under the name of *cervicalis defcendens*. Morgagni has very properly confidered it as a part of the facro-lumbalis.

(K) At the upper part of this mufcle a broad thin layer of flefhy fibres is found croffing, and intimately adhering to it. This portion, which is defcribed by Albinus, under the name of *tranfverfalis cervicis*, may very properly be confidered as an appendage to the longiffimus dorfi. It arifes from the tranfverfe proceffes of the five or fix fuperior dorfal vertebræ, and is inferted into the tranfverfe proceffes of the fix inferior cervical vertebræ. By means of this appendage the longiffimus dorfi may ferve to move the neck to one fide, or obliquely backwards.

(L) Anatomifts in general have unneceffarily multiplied the mufcles of the fpine. Albinus has the merit of having introduced greater fimplicity into this part of myology. Under the name of *multifidus fpinæ*, he has very properly included thofe portions of mufcular flefh intermixed with tendinous fibres, fituated clofe to the back part of the fpine, and which are defcribed by Douglas under the names of *tranfverfales colli, dorfi, & lumborum*

(M) The ancients gave it this name from its refemblance to an irregular triangle (σκαληνος). It confifts of three flefhy portions. The anterior one affords a paffage to the axillary artery, and between this and the middle portion we find the nerves going to the upper extremities. The middle is in part covered by the pofterior portion, which is the longeft and thinneft of the three.

	Name.	Origin.	Insertion.	Use.
	21. Inter-ſpinales (N).	From the upper part of each of the ſpinous proceſſes of the ſix inferior cervical vertebræ.	Into the under part of each of the ſpinous proceſſes of the vertebræ above.	To draw the ſpinous proceſſes towards each other.
	22. Inter-tranſverſales (O).	From the upper part of each of the tranſverſe proceſſes of the vertebræ.	Into the under part of each of the tranſverſe proceſſes of the vertebræ above.	To draw the tranſverſe proceſſes towards each other.
MUSCLES within the cavity of the abdomen, on the anterior and lateral parts of the ſpine,	1. Pſoas parvus (P).	From the ſides and tranſverſe proceſſes of the uppermoſt lumbar vertebra, and ſometimes of the lowermoſt dorſal vertebra.	Into the brim of the pelvis, at the junction of the os pubis with the ilium.	To bend the loins forwards.
	2. Pſoas magnus.	From the bodies and tranſverſe proceſſes of the laſt dorſal, and all the lumbar vertebræ.	Into the os femoris, a little below the trochanter minor.	To bend the thigh forwards.
	3. Iliacus internus.	From the inner lip, hollow part, and edge of the os ilium.	In common with the pſoas magnus.	To aſſiſt the pſoas magnus.
	4. Quadratus lumborum (Q).	From the poſterior part of the ſpine of the ilium.	Into the tranſverſe proceſſes of the four uppermoſt lumbar vertebræ, the inferior edge of the laſt rib, and the ſide of the lowermoſt dorſal vertebra.	To ſupport the ſpine, or to draw it to one ſide.
	5. Coccygæus.	From the poſterior and inner edge of the ſpine of the iſchium.	Into the lower part of the os ſacrum, and almoſt the whole length of the os coccygis latterally.	To draw the os coccygis forwards and inwards (R).
——— on the ſcapula and upper part of the os humeri,	1. Deltoides (S).	From the clavicle, proceſſus acromion, and ſpine of the ſcapula.	Into the anterior and middle part of the os humeri.	To raiſe the arm.
	2. Supra-ſpinatus.	From the baſis, ſpine, and upper coſta of the ſcapula.	Into a large tuberoſity at the head of the os humeri.	To raiſe the arm.

3. Infra-

(N) In the generality of anatomical books we find theſe muſcles divided into *inter-ſpinales cervicis*, *dorſi*, and *lumborum*, but we do not find any ſuch muſcles either in the loins or back.

(O) Theſe muſcles are to be found only in the neck and loins; what have been deſcribed as the *inter-tranſverſales dorſi* being rather ſmall tendons than muſcles.

(P) This and the following pair of muſcles derive their name of *pſoas* from ψοα, *lumbus*, on account of their ſituation at the anterior part of the loins.

(Q) So called from its ſhape, which is that of an irregular ſquare.

(R) Some of the fibres of this muſcle are united with thoſe of the levator ani, ſo that it aſſiſts in cloſing the lower part of the pelvis.

(S) So named from its ſuppoſed reſemblance to the Greek Δ reverſed.

	Name.	*Origin.*	*Infertion.*	*Ufe.*
	3. Infra-fpinatus.	From the bafis and fpine of the fcapula.	Into the upper and middle part of the tuberofity.	To roll the os humeri outwards.
	4. Teres minor(T).	From the inferior cofta of the fcapula.	Into the lower part of the tuberofity.	To affift the infra fpinatus.
	5. Teres major.	From the inferior angle, and inferior cofta of the fcapula.	Into the ridge at the inner fide of the groove formed for the long head of the biceps.	To affift in the rotatory motion of the arm.
	6. Subfcapularis.	From the bafis, fuperior and inferior coftæ of the fcapula.	Into the upper part of a fmall tuberofity at the head of the os humeri.	To roll the arm inwards.
	7. Coraco-brachialis (U).	From the coracoid procefs of the fcapula.	Into the middle and inner fide of the os humeri.	To roll the arm forwards and upwards.
MUSCLES on the os humeri, - -	1. Biceps flexor cubiti.	By two heads, one from the coracoid procefs, and the other, or long head, from the upper and outer edge of the glenoid cavity of the fcapula.	Into the tuberofity at the upper end of the radius.	To bend the fore-arm.
	2. Brachialis internus.	From the os humeri, below, and at each fide of the tendon of the deltoides.	Into a fmall tuberofity at the fore part of the coronoid procefs of the ulna.	To affift in bending the fore-arm.
	3. Triceps extenfor cubiti.	By three heads: the firft, from the inferior cofta of the fcapula; the fecond, from the upper and outer part of the os humeri; and the third, from the back part of that bone.	Into the upper and outer part of the olecranon.	To extend the fore-arm.
——— on the fore-arm, - -	1. Supinator longus.	From the outer ridge and anterior furface of the os humeri, a little above its outer condyle.	Into the radius near its ftyloid procefs.	To affift in turning the palm of the hand upwards.
	2. Extenfor carpi radialis longus.	Immediately below the origin of the fupinator longus.	Into the upper part of the metacarpal bone of the fore-finger.	To extend the wrift.
	3. Extenfor carpi radialis brevis.	From the outer and lower part of the outer condyle of the os humeri, and the upper part of the radius.	Into the upper part of the metacarpal bone of the middle finger.	To affift the extenfor longus.
	4. Extenfor digitorum communis.	From the outer condyle of the os humeri.	Into the back part of all the bones of the four fingers.	To extend the fingers.

5. Extenfor

(T) This and the following pair are called *teres*, from their being of a long and round fhape.
(U) This mufcle affords a paffage to the mufculo-cutaneous nerve.

Name.	Origin.	Insertion.	Use.
5. Extensor minimi digiti.	From the outer condyle of the os humeri.	Into the bones of the little finger.	To extend the little finger.
6. Extensor carpi ulnaris.	From the outer condyle of the os humeri.	Into the metacarpal bone of the little finger.	To assist in extending the wrist.
7. Anconæus (v).	From the outer condyle of the os humeri.	Into the outer edge of the ulna.	To extend the fore arm.
8. Flexor carpi ulnaris.	From the inner condyle of the os humeri, and anterior edge of the olecranon (w).	Into the os pisiforme.	To assist in bending the hand.
9. Palmaris longus.	From the inner condyle of the os humeri.	Into the internal annular ligament, and aponeurosis palmaris (x).	To bend the hand.
10. Flexor carpi radialis.	From the inner condyle of the os humeri.	Into the metacarpal bone of the fore finger.	To bend the hand.
11. Pronator radii teres.	From the outer condyle of the os humeri, and coronoid process of the ulna.	Into the anterior and convex edge of the radius, near its middle.	To roll the hand inwards.
12. Flexor sublimis perforatus (y).	From the inner condyle of the os humeri, inner edge of the coronoid process of the ulna, and upper and anterior part of the radius.	Into the second bone of each finger.	To bend the second joint of the fingers.
13. Supinator radii brevis.	From the outer condyle of the os humeri, and posterior surface and outer edge of the ulna.	Into the anterior, inner, and upper part of the radius.	To roll the radius outwards.
14. Abductor pollicis longus.	From the middle and back part of the ulna, interosseous ligament, and radius.	By two tendons into the os trapezium, and first bone of the thumb.	To stretch the first bone of the thumb outwards.
15. Extensor minor pollicis.	From the back part of the ulna, and interosseous ligament and radius.	Into the convex part of the second bone of the thumb.	To extend the second bone of the thumb obliquely outwards.
16. Extensor major pollicis.	From the back of the ulna and interosseous ligament.	Into the third and last bone of the thumb.	To stretch the thumb obliquely backwards.
17. Indicator.	From the middle of the ulna.	Into the metacarpal bone of the fore-finger.	To extend the fore-finger.

18 Flexor

(v) So called from αγκων, *cubitus*.

(w) Between the two origins of this muscle we find the ulnor-nerve going to the fore arm.

(x) The aponeurosis palmaris is a tendinous membrane that extends over the palm of the hand. Some anatomists have supposed it to be a production of the tendon of this muscle, but without sufficient grounds; for in some subjects we find the palmaris longus inserted wholly into the annular ligament, so as to be perfectly distinct from this aponeurosis; and it now and then happens, that no palmaris longus is to be found, whereas this expansion is never deficient.

(y) This muscle is named *perforatus*, on account of the four tendons in which it terminates, being perforated by those of another muscle, the perforans.

Of the Muſcles.

	Name.	Origin.	Inſertion.	Uſe.
	18. Flexor profundus perforans.	From the upper and fore part of the ulna, and interoſſeous ligament.	Into the fore part of the laſt bone of each of the fingers.	To bend the laſt joint of the fingers.
	19. Flexor longus pollicis.	From the upper and fore part of the radius.	Into the laſt joint of the thumb.	To bend the laſt joint of the thumb.
	20. Pronator radii quadratus.	From the inner and lower part of the ulna.	Into the radius, oppoſite to its origin.	To roll the radius inwards, and of courſe to aſſiſt in the pronation of the hand.
Muscles on the hand	1. Lumbricales (z).	From the tendons of the perforans.	Into the tendons of the extenſor digitorum communis.	To bend the firſt, and to extend the two laſt joints of the fingers (A).
	2. Abductor brevis pollicis.	From the fore part of the internal annular ligament, os ſcaphoides, and one of the tendons of the abductor longus pollicis.	Into the outer ſide of the 2d bone of the thumb, near its root.	To move the thumb from the fingers.
	3. Opponens pollicis.	From the inner and anterior part of the internal annular ligament, and from the os ſcaphoides.	Into the firſt bone of the thumb.	To move the thumb inwards, and to turn it upon its axis.
	4. Flexor brevis pollicis.	From the os trapezoides, internal annular ligament, os magnum, and os unciforme.	Into the oſſa ſeſamoidea and ſecond bone of the thumb.	To bend the ſecond joint of the thumb.
	5. Adductor pollicis.	From the metacarpal bone of the middle finger.	Into the baſis of the ſecond bone of the thumb.	To move the thumb towards the fingers.
	6. Abductor indicis.	From the inner ſide of the firſt bone of the thumb, and from the os trapezium.	Into the firſt bone of the fore finger poſteriorly.	To move the fore finger towards the thumb.
	7. Palmaris brevis	From the internal annular ligament, and aponeuroſis palmaris.	Into the os piſiforme, and the ſkin covering the abductor minimi digiti.	To contract the palm of the hand.
	8. Abductor minimi digiti.	From the internal annular ligament and os piſiforme.	Into the ſide of the firſt bone of the little finger.	To draw the little finger from the reſt.
	9. Flexor parvus minimi digiti.	From the os unciforme and internal annular ligament.	Into the firſt bone of the little finger.	To bend the little finger.
	10. Adductor metacarpi minimi digiti.	From the os unciforme and internal annular ligament.	Into the metacarpal bone of the little finger.	To move that bone towards the reſt.
	11. Interoſſei interni.	Situated between the metacarpal bones.	Into the roots of the fingers.	To extend the fingers and move them towards the thumb (B).

Interoſſei

(z) So named from their being ſhaped ſomewhat like the lumbricus or earth-worm.

(A) Fallopius was the firſt who remarked the two oppoſite uſes of this muſcle. Their extending power is owing to their connection with the extenſor communis.

(B) The third interoſſeus internus (for there are four of the externi and three of the interni) differs from the reſt in drawing the middle finger from the thumb.

	Name.	Origin.	Insertion.	Use.
	Interossei externi.	Situated between the metacarpal bones on the back of the hand.	Into the roots of the fingers.	To extend the fingers; but the first draws the middle finger inwards, the second draws it outwards, and the third draws the ring finger inwards.
MUSCLES at the back-part of the pelvis, and upper part of the thigh, - -	1. Glutæus (c) maximus.	From the spine of the ilium, posterior sacro-ischiatic ligaments, os sacrum, and os coccygis.	Into the upper part of the *linea aspera* of the os femoris.	To extend the thigh and draw it outwards.
	2. Glutæus medius.	From the spine and superior surface of the ilium.	Into the outer and back part of the great trochanter of the os femoris.	To draw the thigh outwards and a little backwards, and when it is bended, to roll it.
	3. Gluteus minimus.	From the outer surface of the ilium and the border of its great niche.	Into the upper and anterior part of the great trochanter.	To assist the former.
	4. Pyriformis (D).	From the anterior part of the os sacrum.	Into a cavity at the root of the trochanter major.	To roll the thigh outwards.
	5. Gemini (E).	By two portions, one from the outer surface of the spine of the ischium; the other from the tuberosity of the ischium and posterior sacro-ischiatic ligament.	Into the same cavity as the pyriformis.	To roll the thigh outwards, and likewise to confine the tendon of the obturator internus, when the latter is in action.
	6. Obturator internus.	From the superior half of the inner border of the foramen thyroideum.	Into the same cavity with the former.	To roll the thigh outwards.
	7. Quadratus (F) femoris.	From the tuberosity of the ischium.	Into a ridge between the trochanter major and trochanter minor.	To move the thigh outwards.
——— on the thigh (G), - -	1. Biceps flexor cruris.	By two heads; one from the tuberosity of the ischium,	Into the upper and back part of the fibula (H).	To bend the leg.

(C) From γλουτος, *nates*. (D) So named from its pear-like shake.

(E) The two portions of this muscle having been described as two distinct muscles by some anatomists, have occasioned it to be named *gemini*. The tendon of the obturator internus runs between these two portions.

(F) This muscle is not of the square shape its name would seem to indicate.

(G) The muscles of the leg and thigh are covered by a broad tendinous membrane called *fascia lata*, that surrounds them in the manner of a sheath. It is sent off from the tendons of the glutæi and other muscles, and dipping down between the muscles it covers, adheres to the linea aspera, and spreading over the joint of the knee, gradually disappears on the leg. It is thickest on the inside of the thigh.

(H) The tendon of this muscle forms the *outer ham-string*.

Name.	Origin.	Infertion.	Ufe.
	the other from the linea afpera near the infertion of the glutæus maximus.		
2. Semi-tendinofus.	From the tuberofity of the ifchium.	Into the upper and inner part of the tibia.	To bend and draw the leg inwards.
3. Semi-membranofus (I).	From the tuberofity of the ifchium.	Into the upper and back part of the head of the tibia.	To bend the leg.
4. Tenfor vaginæ femoris.	From the fuperior and anterior fpinous procefs of the ilium.	Into the inner fide of the fafcia lata, which covers the outfide of the thigh.	To ftretch the fafcia.
5. Sartorius.	From the fuperior and anterior fpinous procefs of the ilium.	Into the upper and inner part of the tibia.	To bend the leg inwards (K).
6. Rectus.	By two tendons; one from the anterior and inferior fpinous procefs of the ilium; the other from the pofterior edge of the cotyloid cavity.	Into the upper and fore-part of the patella.	To extend the leg.
7. Gracilis.	From the fore-part of the ifchium and pubis.	Into the upper and inner part of the tibia.	To bend the leg.
8. Vaftus externus (L).	From the anterior and lower part of the great trochanter, and the outer edge of the linea afpera.	To the upper and outer part of the patella.	To extend the leg.
9. Vaftus internus.	From the inner edge of the linea afpera, beginning between the fore-part of the os femoris and the root of the leffer trochanter.	Into the upper and inner part of the patella.	To extend the leg.
10. Cruræus (M).	From the outer and anterior parrt of the leffer trochanter.	Into the upper part of the patella.	To extend the leg.
11. Pectinalis.	From the anterior edge of the os pubis, or pectinis, as it is fometimes called.	Into the upper and fore-part of the linea afpera.	To draw the thigh inwards, upwards, and to roll it a little outwards.

(I) So named on account of its origin, which is by a broad flat tendon three inches long.

(K) Spigelius was the firft who gave this the name of *fartorius*, or the taylor's mufcle, from its ufe in croffing the legs.

(L) The vaftus externus, vaftus internus, and cruræus, are fo intimately connected with each other, that fome anatomifts have been induced to confider them as a *triceps*, or fingle mufcle with three heads.

(M) Under the cruræus we fometimes meet with two fmall mufcles, to which Albinus has given the name of *fub-cruræi*. They terminate on each fide of the patella, and prevent the capfular ligament from being pinched. When they are wanting, which is very often the cafe, fome of the fibres of the cruræus are found adhering to the capfula.

	Name.	*Origin.*	*Insertion.*	*Use.*
	12. Adductor longus femoris (N).	From the upper and fore part of the os pubis.	Near the middle and back part of the linea aspera.	
	13. Adductor brevis femoris.	From the fore part of the ramus of the os pubis.	Into the inner and upper part of the linea aspera.	To draw the thigh inwards, upwards, and to roll it a little outwards.
	14. Adductor magnus femoris.	From the lower and fore part of the ramus of the os pubis.	Into the whole length of the linea aspera.	
	15. Obturator externus.	From part of the obturator ligament, and the inner half of the circumference of the foramen thyroideum.	Into the os femoris near the root of the great trochanter.	To move the thigh outwards in an oblique direction, and likewise to bend and draw it inwards.
Muscles on the leg,	1. Gastrocremius (O) externus.	By two heads; one from the inner condyle, the other from the outer condyle of the os femoris.	By a great round tendon, common to this and the following muscle.	To extend the foot.
	2. Gastrocremus (P) internus.	By two heads; one from the back part of the head of the fibula, the other from the upper and back part of the tibia.	By a large tendon (the *tendo achillis*) commmon to this and the former muscle, into the lower and back part of the os calcis.	To extend the foot.
	3. Plantaris (Q).	From the uppper and posterior part of the outer condyle of the os femoris.	Into the inside of the back part of the os calcis.	To assist in extending the foot.
	4. Popliteus (R).	From the outer condyle of the thigh.	Into the upper and inner part of the tibia.	To assist in bending the leg and rolling it inwards.
	5. Flexor longus digitorum pedis (S)	From the upper and inner part of the tibia.	By four tendons, which, after passing through the perforations in those of the flexor digitorum brevis, are inserted into the last bone of all the toes, except the great toe.	To bend the last joint of the toe.
	6. Flexor longus pollicis pedis.	From the back part, and a little below the head of the fibula.	Into the last bone of the great toe.	To bend the great toe.

(N) This and the two following muscles have been usually, but improperly, considered as forming a single muscle with three heads, and on that account named *triceps femoris*.

(O) Γαςροκνημια, *sura*, "the calf of the leg."

(P) This muscle is by some anatomists named *soleus*, on account of its being shaped like the sole-fish.

(Q) This muscle has gotten the name of *plantaris*, from its being supposed to furnish the aponeurosis that covers the sole of the foot; but it does not in the least contribute to the formation of that tendinous expansion.

(R) So called on account of its situation at the ham (*poples*).

(S) This muscle, about the middle of the foot, unites with a fleshy mass, which, from its having first been described by Sylvius, is usually called *massa carnea* Jacobi Sylvii.

	Name.	Origin.	Insertion.	Use.
	7. Tibialis posticus.	From the back part and outer edge of the tibia, and likewise from the interosseous ligament and adjacent part of the fibula.	Into the inner and upper part of the os naviculare and side of the os cuneiforme medium.	To move the foot inwards.
	8. Peroneus longus.	From the outer side of the head of the tibia, and also from the upper, anterior, and outer part of the *perone* or fibula, to which it adheres for a considerable way down.	Into the metatarsal bone of the great toe.	To move the foot outwards.
	9. Peroneus brevis.	From the outer and fore-part of the fibula.	Into the metatarsal bone of the little toe.	To assist the last described muscle.
	10. Extensor longus digitorum pedis.	From the upper, outer, and fore part of the tibia, interosseous ligament, and inner edge of the fibula.	By four tendons into the first joint of the smaller toes.	To extend the toes.
	11. Peroneus tertius.	From the fore-part of the lower half of the fibula, and from the interosseous ligament.	Into the metatarsal bone of the little toe.	To bend the foot.
	12. Tibialis anticus.	From the upper and fore part of the tibia.	Into the os cuneiforme internum.	To bend the foot.
	13. Extensor proprius pollicis pedis.	From the upper and fore part of the tibia.	Into the convex surface of the bones of the great toe.	To extend the great toe.
MUSCLES on the foot,	1. Extensor brevis digitorum pedis.	From the upper and anterior part of the os calcis.	By four tendons; one of which joins the tendon of the externus longus pollicis, and the other three the tendons of the extensor digitorum longus.	To extend the toes.
	2. Flexor brevis digitorum pedis.	From the lower part of the os calcis.	By four tendons, which, after affording a passage to those of the flexor longus, are inserted into the second phalanx of each of the small toes.	To bend the second joint of the toes.
	3. Abductor pollicis pedis.	From the inner and lower part of the os calcis.	Into the first joint of the great toe.	To move the great toe from the other toes.
	4. Abductor minimi digiti.	From the outer tubercle of the os calcis, the root of the metatarsal bone of the little toe, and also from the aponeurosis plantaris.	Into the outer side of the first joint of the little toe.	To draw the little toe outwards.

5. Lumbricales

Name.	Origin.	Insertion.	Use.
5. Lumbricales pedis.	From the tendons of the flexor longus digitorum pedis.	Into the tendinous expansion at the upper part of the toes.	To draw the toes inwards.
6. Flexor brevis pollicis pedis.	From the inferior and anterior part of the os calcis, and also from the inferior part of the os cuneiforme externum.	By two tendons into the first joint of the great toe.	To bend the first joint of the great toe.
7. Adductor pollicis pedis.	From near the roots of the metatarsal bones of the 2d, 3d, and 4th toes.	Into the outer os sesamoideum, or first joint of the great toe.	To draw the great toe nearer to the rest, and also to bend it.
8. Transversales pedis.	From the outer and under part of the anterior end of the metatarsal bone of the little toe.	Into the inner os sesamoideum, and anterior end of the metatarsal bone of the great toe.	To contract the foot.
9. Flexor brevis minimi digiti pedis.	From the basis of the metatarsal bone of the little toe.	Into the first joint of the little toe.	To bend the little toe.
10. Interossei pedis interni (T). ——— externi (U).	Situated between the metatarsal bones.		

EXPLANATION OF PLATES XXI. and XXII.

Plate XXI.

Fig. 1. The Muscles immediately under the common teguments on the anterior part of the body are represented on the right side; and on the left side the Muscles are seen which come in view when the exterior ones are taken away.

A, The frontal muscle. B, The tendinous aponeurosis which joins it to the occipital; hence both named *occipito-frontalis*. C, Attolens aurem. D, The ear. E, Anterior auris. F F, Orbicularis palpebrarum. G, Levator labii superioris alæque nasi. H, Levator anguli oris. I, Zygomaticus minor. K, Zygomaticus major. L, Masseter. M, Orbicularis oris. N, Depressor labii inferioris. O, Depressor anguli oris. P, Buccinator. Q Q, Platysma myoides. R R, Sterno-cleido-mastoidæus. S, Part of the trapezius. T, Part of the scaleni.

Superior Extremity.—U, Deltoides. V, Pectoralis major. W, Part of the latissimus dorsi. X X, Biceps flexor cubiti. Y Y, Part of the brachialis externus. Z Z, The beginning of the tendinous aponeurosis (from the biceps), which is spread over the muscles of the fore-arm. a a, Its strong tendon inserted into the tubercle of the radius. b b, Part of the brachialis internus. c, Pronator radii teres. d, Flexor carpi radialis. e, Part of the flexor carpi ulnaris. f, Palmaris longus. g, Aponeurosis palmaris. 3, Palmaris brevis. 1, Ligamentum carpi annulare. 2 2, Abductor minimi digiti. h, Supinator radii longus. i, The tendons of the thumb. k, Abductor pollicis. l, Flexor pollicis longus. m m, The tendons of the fluxor sublimis perforatus, profundus perforans, and lumbricales.—The sheaths are entire in the right hand,—in the left cut open, to show the tendons of the flexor profundus perforating the sublimis.

Muscles not referred to—in the left superior extremity.—n, Pectoralis minor, seu serratus anticus minor. o, The two heads of (x x) the biceps. p, Coraco-brachialis. q q, The long head of the triceps extensor cubiti. r r, Teres major. s s, Subscapularis. t t, Extensores radiales. u, Supinator brevis. v, The cut extremity of the pronator teres. w, Flexor sublimis perforatus. x, Part of the flexor profundus. y, Flexor pollicis longus. z, Part of the flexor pollicis brevis. 4, Abductor minimi digiti. 5, The four lumbricales.

Trunk.—6, Serrated extremities of the serratus anticus major. 7 7, Obliquus externus abdominis. 8 8, The linea alba. 9, The umbilicus. 10, Pyramidalis. 11 11, The spermatic cord. On the left side it is covered by the cremaster. 12 12, Rectus abdominis. 13, Obliquus internus. 14 14, &c. Intercostal muscles.

Inferior Extremities.—*a a*, The gracilis. *b b*, Parts of the triceps. *c c*, Pectialis. *d d*, Psoas magnus. *e e*, Iliacus internus. *f*, Part of the glutæus medius. *g*, Part of the glutæus minimus. *h*, Cut extremity of the rectus cruris. *i i*, Vastus externus. *k*, Tendon of the rectus cruris. *l l*, Vastus internus. * Sartorius

(T) The interossei interni are three in number; their use is to draw the smaller toes towards the great toe.

(U) The interossei externi are four in number; the first serves to move the fore-toe towards the great toe; the rest move the toes outwards. All the interossei assist in extending the toes.

Of the Muscles.

* Sartorius muscle. ** Fleshy origin of the tensor vaginæ femoris or membranosus. Its tendinous aponeurosis covers (*i*) the vastus externus in the right side. *m m*, Patella. *n n*, Ligament or tendon from it to the tibia. *o*, Rectus cruris. *p*, Cruræus. *q q*, The tibia. *r r*, Part of the gemellus or gastrocnemius externus. *sss*, Part of the soleus or gastrocnemius internus. *t*, Tibialis anticus. *u*, Tibialis posticus. *v v*, Peronæi muscles. *w w*, Extensor longus digitorum pedis. *x x*, Extensor longus pollicis pedis. *y*, Abductor pollicis pedis.

Fig. 2. The Muscles, Glands, &c. of the Left Side of the Face and Neck, after the common Teguments and Platysma myoides have been taken off.

a, The frontal muscle. b, Temporalis and temporal artery. c, Orbicularis palpebrarum. d, Levator labii superioris alæqui nasi. e, Levator anguli oris. f, Zygomaticus. g, Depressor labii inferioris. h, Depressor anguli oris. i, Buccinator. k, Masseter. l l, Parotid gland. m, Its duct. n, Sterno-cleido-mastoidæus. o, Part of the trapezius. p, Sterno-hyoidæus. q, Sterno-thyroidæus. r, Omo-hyoidæus. s, Levator scapulæ. t t, Scaleni. u, Part of the splenius.

Fig. 3. The Muscles of the Face and Neck in view after the exterior ones are taken away.

a a, Corrugator supercilii. b, Temporalis. c, Tendon of the levator palpebræ superioris. d, Tendon of the orbicularis palpebrarum. e, Masseter. f, Buccinator. g, Levator anguli oris. h, Depressor labii superioris alæque nasi. i, Orbicularis oris. k, Depressor anguli oris. l, Muscles of the os hyoides. m, Sterno-cleido-mastoidæus.

Fig. 4. Some of the Muscles of the Os Hyoides and Submaxillary Gland.

a, Part of the masseter muscle. b, Posterior head of the digastric. c, Its anterior head. d d, Sterno-hyoidæus. e, Omo-hyoidæus. f, Stylo-hyoidæus. g, Submaxillary gland in situ.

Fig. 5. The Submaxillary Gland and Duct.

a, Musculus mylo-hyoidæus. b, Hyo-glossus. c, Submaxillary gland extra situ. d, Its duct.

Plate XXII.

Fig. 1. The Muscles immediately under the common teguments on the posterior part of the body are represented in the right side; and on the left side the Muscles are seen which come in view when the exterior ones are taken away.

Head—A A, Occipito-frontalis. B, Attollens aurem. C, Part of the orbicularis palpebrarum. D, Masseter. E, Pterygoidæus internus.

Trunk.—Right side. F F F, Trapezius seu cucullaris. G G G G, Latissimus dorsi. H, Part of the obliquus externus abdominis.

Trunk.—Left side. I, Splenius. K, Part of the complexus. L, Levator scapulæ. M, Rhomboides. N N, Serratus posticus inferior. O, Part of the longissimus dorsi. P, Part of the sacro-lumbalis. Q, Part of the semi-spinalis dorsi. R, Part of the serratus anticus major. S, Part of the obliquus internus abdominis.

Of the Muscles.

Superior Extremity.—Right side. T, Deltoides. U, Triceps extensor cubiti. V, Supinator longus. W W, Extensores carpi radialis longior and brevior. X X, Extensor carpi ulnaris. Y Y, Extensor digitorum communis. Z, Abductor indicis. 1 2 3, Extensores pollicis.

Superior Extremity.—Left side. a, Supra spinatus. b, Infra-spinatus. c, Teres minor. d, Teres major. e, Triceps extensor cubiti. f f, Extensores carpi radiales. g, Supinator brevis. h, Indicator. 1 2 3, Extensores pollicis. i, Abductor minimi digiti. k, Interossei.

Inferior Extremity.—Right side. l, Glutæus maximus. m, Part of the glutæus medius. n, Tensor vaginæ femoris. o, Gracilis. p p, Adductor femoris magnus. q, Part of the vastus internus. r, Semimembranosus. s, Semitendinosus. t, Long head of the biceps flexor cruris. u u, Gastrocnemius externus seu gemellus. v, Tendo Achillis. w, Soleus seu gastrocnemius internus. x x, Peronæus longus and brevis. y, Tendons of the flexor longus digitorum pedis;—and under them * flexor brevis digitorum pedis. z, Abductor minimi digiti pedis.

Inferior Extremity.—Left side. *m*, *n*, *o*, *p p*, *q*, *r*, *s*, *t*, *v*, *w w*, *x x*, *y*, *z*, Point the same parts as in the right side. *a*, Pyriformis. *b b*, Gemini. *c c*, Obturator internus. *d*, Quadratus femoris. *e*, Coccygæus. *f*, The short head of the biceps flexor cruris. *g g*, Plantaris. *h*, Poplitæus. *i*, Flexor longus pollicis pedis.

Fig. 2. The Palm of the Left Hand after the common Teguments are removed, to show the Muscles of the Fingers.

a, Tendon of the flexor carpi radialis. b, Tendon of the flexor carpi ulnaris. c, Tendons of the flexor sublimis perforatus, profundus perforans and lumbricales. d, Abductor pollicis. e e, Flexor pollicis longus. f, Flexor pollicis brevis. g, Palmaris brevis. h, Abductor minimi digiti. i, Ligamentum carpiannulare. k, A probe put under the tendons of the flexor digitorum sublimis; which are perforated by l, the flexor digitorum profundus. m m m m, Lumbricales. n, Adductor pollicis.

Fig. 3. A Fore-view of the Foot and Tendons of the Flexores Digitorum.

a, Cut extremity of the tendo Achillis. b, Upper part of the astragalus. c, Os calcis. d, Tendon of the tibialis anticus. e, Tendon of the extensor pollicis longus. f, Tendon of the peronæus brevis. g, Tendons of the flexor digitorum longus, with the nonus Vesalii. h h, The whole of the flexor digitorum brevis.

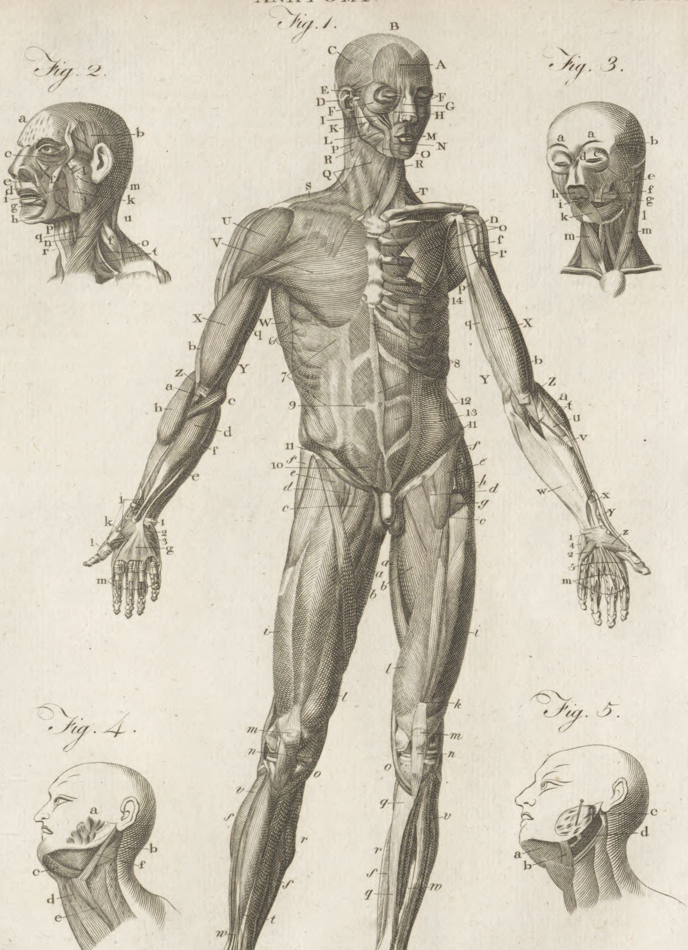
Fig. 4. Muscles of the Anus.

a a, An outline of the buttocks, and upper part of the thighs. b, The testes contained in the scrotum. c c, Sphincter ani. d, Anus. e, Levator ani. f f, Erector penis. g g, Accelerator urinæ. h, Corpus cavernosum urethræ.

Fig. 5. Muscles of the Penis.

a a, b, d, e e, f f, h, point the same as in fig. 4. c, Sphincter ani. g g, Transversalis penis.

PART



A.Bell Prin. Wal. Sculptor fecit.


Fig. 2.
Fig. 1.
Fig. 3.
Fig. 4.
Fig. 5.
A Bell Prin Wal Sculptor fecit

PART III. Of the ABDOMEN, or LOWER BELLY.

88. THE abdomen, or lower belly, extends from the lower extremity of the fternum, or the hollow, ufually called the pit of the ftomach, and more properly *fcrobiculus cordis*, to the lower part of the trunk.

It is diftinguifhed into three divifions called *regions;* of thefe the upper one, which is called the *epigaftric region*, begins immediately under the fternum, and extends to within two fingers breadth of the navel, where the middle or *umbilical region* begins, and reaches to the fame diftance below the navel. The third, which is called the *hypogaftric*, includes the reft of the abdomen, as far as the os pubis.

Each of thefe regions is fubdivided into three others; two of which compofe the fides, and the other the middle part of each region.

The middle part of the upper region is called *epigaftrium*, and its two fides *hypochondria*. The middle part of the next region is the umbilical region, properly fo called, and its two fides are the flanks, or iliac regions. Laftly, the middle part of the lower region retains the name of hypogaftrium, and its fides are called inguina or groins. The back part of the abdomen bears the name of lumbar region.

Thefe are the divifions of the lower belly, which are neceffary to be held in remembrance, as they frequently occur in furgical and anatomical writing. We will now proceed to examine the contents of the abdomen; and after having pointed out the names and arrangement of the feveral vifcera contained in it, defcribe each of them feparately.

After having removed the fkin, adipofe membrane, and abdominal mufcles, we difcover the peritonæum or membrane that envelopes all the vifcera of the lower belly. This being opened, the firft part that prefents itfelf is the omentum or cawl, floating on the furface of the inteftines, which are likewife feen every where loofe and moift, and making a great number of circumvolutions through the whole cavity of the abdomen. The ftomach is placed in the epigaftrium, and under the ftomach is the pancreas. The liver fills the right hypochondrium, and the fpleen is fituated in the left. The kidneys are feen about the middle of the lumbar region, and the urinary bladder and parts of generation are feated in the lower divifion of the belly.

Sect. I. *Of the Peritonæum.*

89. The peritonæum is a ftrong fimple membrane, by which all the vifcera of the abdomen are furrounded, and in fome meafure fupported. Many anatomical writers, particularly Winflow, have defcribed it as being compofed of two diftinct membranous laminæ; but their defcription feems to be erroneous. What perhaps appeared to be a fecond lamina, being found to be fimply a cellular coat, which fends off productions to the blood-veffels paffing out of the abdominal cavity. The aorta and vena cava likewife derive a covering from the fame membrane, which feems to be a part of the cellular membrane we have already defcribed.

The peritonæum, by its productions and reduplications, envelopes the greateft part of the abdominal vifcera. It is foft, and capable of confiderable extenfion; and is kept fmooth and moift by a vapour, which is conftantly exhaling from its inner furface, and is returned again into the circulation by the abforbents.

This moifture not only contributes to the foftnefs of the peritonæum, but prevents the attrition, and other ill effects which would otherwife probably be occafioned, by the motion of the vifcera upon each other.

When this fluid is fupplied in too great a quantity, or the abforbents become incapable of carrying it off, it accumulates, and conftitutes an afcites or dropfy of the belly; and when by any means the exhalation is difcontinued, the peritonæum thickens, becomes difeafed, and the vifcera are fometimes found adhering to each other.

The peritonæum is not a very vafcular membrane. In a found ftate it feems to be endued with little or no feeling, and the nerves that pafs through it appear to belong to the abdominal mufcles.

Sect. II. *Of the Omentum.*

The omentum, epiploon, or cawl, is a double membrane, produced from the peritonæum. It is interlarded with fat, and adheres to the ftomach, fpleen, duodenum, and colon; from thence hanging down loofe and floating on the furface of the inteftines. Its fize is different in different fubjects. In fome it defcends as low as the pelvis, and it is commonly longer at the left fide than the right. 90.

This part, the fituation of which we have juft now defcribed, was the only one known to the ancients under the name of *epiploon;* but at prefent we diftinguifh three omenta, viz. *omentum magnum colico gaftricum*, *omentum parvum hepatico gaftricum*, and *omentum colicum*. They all agree in being formed of two very delicate laminæ, feparated by a thin layer of cellular membrane.

The omentum magnum colico gaftricum, of which we have already fpoken, derives its arteries from the fplenic and hepatic. Its veins terminate in the venæ portæ. Its nerves, which are very few, come from the fplenic and hepatic plexus.

The omentum parvum hepatico gaftricum, abounds lefs with fat than the great epiploon. It begins at the upper part of the duodenum, extends along the leffer curvature of the ftomach as far as the œfophagus, and terminates about the neck of the gall-bladder, and behind the left ligament of the liver, fo that it covers the leffer lobe; near the beginning of which we may obferve a fmall opening, firft defcribed by Winflow, through which the whole pouch may eafily be diftended

Of the Abdomen.

ed with air (x). The veſſels of the omentum parvum are derived chiefly from the coronary ſtomachic arteries and veins.

The omentum colicum begins at the fore part of the cœcum and right ſide of the colon. It appears as a hollow conical appendage to theſe inteſtines, and uſually terminates at the back of the omentum magnum. It ſeems to be nothing more than a membranous coat of the cœcum and colon, aſſuming a conical ſhape when diſtended with air.

The uſes of the omentum are not yet ſatisfactorily determined. Perhaps by its ſoftneſs and looſeneſs it may ſerve to prevent thoſe adheſions of the abdominal viſcera, which have been found to take place when the fat of the omentum has been much waſted. Some authors have ſuppoſed, that it aſſiſts in the preparation of bile; but this idea is founded merely on conjecture.

Sect. III. *Of the Stomach.*

91. The ſtomach is a membranous and muſcular bag, in ſhape not unlike a bagpipe, lying acroſs the upper part of the abdomen, and inclining rather more to the left than the right ſide.

It has two orifices, one of which receives the end of the œſophagus, and is called the *cardia*, and ſometimes the left and upper orifice of the ſtomach; though its ſituation is not much higher than the other, which is ſtyled the right and inferior orifice, and more commonly the *pylorus*: both theſe openings are more elevated than the body of the ſtomach.

The aliment paſſes down the œſophagus into the ſtomach through the cardia, and after having undergone the neceſſary digeſtion, paſſes out at the pylorus where the inteſtinal canal commences.

The ſtomach is compoſed of four tunics or coats, which are ſo intimately connected together that it requires no little dexterity in the anatomiſt to demonſtrate them. The exterior one is membranous, being derived from the peritonæum.—The ſecond is a muſcular tunic, compoſed of fleſhy fibres which are in the greateſt number about the two orifices.—The third is called the nervous coat, and within this is the villous or velvet-like coat which compoſes the inſide of the ſtomach.

The two laſt coats being more extenſive than the two firſt, form the folds, which are obſerved every where in the cavity of this viſcus, and more particularly about the pylorus; where they ſeem to impede the too haſty excluſion of the aliment, making a conſiderable plait, called *valvula pylori*.

The inner coat is conſtantly moiſtened by a mucus, which approaches to the nature of the ſaliva, and is called the gaſtric juice; this liquor has been ſuppoſed to be ſecreted by certain minute glands (y) ſeated in the nervous tunic, whoſe excretory ducts open on the ſurface of the villous coat.

The arteries of the ſtomach called the gaſtric arteries are principally derived from the cæliac; ſome of its veins paſs to the ſplenic, and others to the vena portæ; and its nerves are chiefly from the eighth pair or par vagum.

The account given of the tunics of the ſtomach may be applied to the whole alimentary canal; for both the œſophagus and inteſtines are, like this viſcus, compoſed of four coats.

Before we deſcribe the courſe of the aliment and the uſes of the ſtomach, it will be neceſſary to ſpeak of other parts which aſſiſt in the proceſs of digeſtion.

Sect. IV. *Of the Oeſophagus.*

The œſophagus or gullet is a membranous and muſcular canal, extending from the bottom of the mouth to the upper orifice of the ſtomach—Its upper part where the aliment is received is ſhaped ſomewhat like a funnel, and is called the *pharynx*. 92.

From hence it runs down cloſe to the bodies of the vertebræ as far as the diaphragm, in which there is an opening through which it paſſes, and then terminates in the ſtomach about the eleventh or twelfth vertebra of the back.

The œſophagus is plentifully ſupplied with arteries from the external carotid, bronchial, and ſuperior intercoſtal arteries; its veins empty themſelves into the vena azygos, internal jugular, and mammary veins, &c.

Its nerves are derived chiefly from the eighth pair.

We likewiſe meet with a mucus in the œſophagus, which every where lubricates its inner ſurface, and tends to aſſiſt in deglutition.—This mucus ſeems to be ſecreted by very minute glands, like the mucus in other parts of the alimentary canal.

Sect. V. *Of the Inteſtines.*

The inteſtines form a canal, which is uſually ſix times longer than the body to which it belongs. This canal extends from the pylorus, or inferior orifice of the ſtomach, to the anus. 93.

It will be eaſily underſtood, that a part of ſuch great length muſt neceſſarily make many circumvolutions, to be confined with ſo many other viſcera within the cavity of the lower belly.

Although the inteſtines are in fact, as we have obſerved, only one long and extenſive canal, yet different parts have been diſtinguiſhed by different names.

The inteſtines are firſt diſtinguiſhed into two parts, one of which begins at the ſtomach, and is called the *thin* or *ſmall inteſtines*, from the ſmall ſize of the canal, when compared with the other part, which is called the *large inteſtines*, and includes the lower portion of the canal down to the anus.

Each of theſe parts has its ſubdiviſions.—The ſmall in-

(x) This membranous bag, though exceedingly thin and tranſparent, is found capable of ſupporting mercury, thrown into it by the ſame channel.

(y) Heiſter, ſpeaking of theſe glands, very properly ſays, "in *porcis* facile, in *homine* raro obſervantur;" for although many anatomical writers have deſcribed their appearance and figure, yet they do not ſeem to have been hitherto ſatisfactorily demonſtrated in the human ſtomach; and the gaſtric juice is now more generally believed to be derived from the exhalant arteries of the ſtomach.

inteſtines being diſtinguiſhed into duodenum, jejunum, and ileum, and the larger portion into cœcum, colon, and rectum.

The ſmall inteſtines fill the middle and fore parts of the belly, while the large inteſtines fill the ſides and both the upper and lower parts of the cavity.

The duodenum, which is the firſt of the ſmall inteſtines, is ſo called, becauſe it is about 12 inches long. It begins at the pylorus and terminates in the jejunum, which is a part of the canal obſerved to be uſually more empty than the other inteſtines.—This appearance gives it its name, and likewiſe ſerves to point out where it begins.

The next diviſion is the ileum, which of itſelf exceeds the united length of the duodenum and jejunum, and has received its name from its numerous circumvolutions. The large circumvolution of the ileum covers the firſt of the large inteſtines called the *cæcum* (x), which ſeems properly to belong to the colon, being a kind of pouch of about four fingers in width, and nearly of the ſame length, having exteriorly a little appendix, called *appendix cœci.*

The cœcum is placed in the cavity of the os ilium on the right ſide, and terminates in the colon, which is the largeſt of all the inteſtines.

This inteſtine aſcends by the right kidney to which it is attached, paſſes under the hollow part of the liver, and the bottom of the ſtomach to the ſpleen, to which it is likewiſe ſecured, as it is alſo to the left kidney; and from thence paſſes down towards the os ſacrum, where, from its ſtraight courſe, the canal begins to take the name of *rectum.*

There are three ligamentous bands extending thro' the whole length of the colon, which by being ſhorter than its two inner coats, ſerve to increaſe the plaits on the inner ſurface of this gut.

The *anus*, which terminates the inteſtinum rectum, is furniſhed with three muſcles; one of theſe is compoſed of circular fibres, and from its uſe in ſhutting the paſſage of the anus is called *ſphincter ani.*

The other two are the *levatores ani*, ſo called, becauſe they elevate the anus after dejection. When theſe by palſy, or any other diſeaſe, loſe the power of contracting, the anus prolapſes; and when the ſphincter is affected by ſimilar cauſes, the fæces are voided involuntarily.

It has been already obſerved, that the inteſtinal canal is compoſed of four tunics; but it remains to be remarked, that here, as in the ſtomach, the two inner tunics being more extenſive than the other two, form the plaits which are to be ſeen in the inner ſurface of the inteſtines, and are called *valvulæ conniventes.*

Some authors have conſidered theſe plaits as tending to retard the motion of the fæces, in order to afford more time for the ſeparation of the chyle; but there are others who attribute to them a different uſe: they contend, that theſe valves, by being naturally inclined downwards, cannot impede the deſcent of the fæces, but that they are intended to prevent their return upwards.

They are probably deſtined for both theſe uſes; for although theſe folds incline to their lower ſide, yet the inequalities they occaſion in the canal are ſufficient to retard in ſome meaſure the progreſſive motion of the fæces, and to afford a greater ſurface for the abſorption of chyle, and their natural poſition ſeems to oppoſe itſelf to the return of the aliment.

Beſides theſe *valvulæ conniventes*, there is one more conſiderable than the reſt, called the *valve of the colon*; which is found at that part of the canal where the inteſtinum ileum is joined to the colon. This valve permits the alimentary pulp to paſs downwards, but ſerves to prevent its return upwards; and it is by this valve, that glyſters are prevented from paſſing into the ſmall inteſtines (y).

Of the little vermiform appendix of the cœcum, it will be ſufficient to ſay, that its uſes have never yet been aſcertained. In birds we meet with two of theſe appendices.

The inteſtines are lubricated by a conſtant ſupply of mucus, which is probably ſecreted by very minute follicles (z). This mucus promotes the deſcent of the alimentary pulp, and in ſome meaſure defends the inner ſurface of the inteſtines from the irritation to which it would, perhaps, otherwiſe be continually expoſed from the aliment; and which, when in a certain degree, excites a painful diſorder called *colic*, a name given to the diſeaſe, becauſe its moſt uſual ſeat is in the inteſtinum colon.

The inteſtines are likewiſe frequently diſtended with air, and this diſtenſion ſometimes occaſions pain, and conſtitutes the flatulent colic.

The arteries of the inteſtines are continuations of the meſenteric arteries, which are derived in two conſiderable branches from the aorta.—The redundant blood is carried back into the vena portarum.

In the rectum the veins are called *hemorrhoidal*, and are there diſtinguiſhed into internal and external: the firſt are branches of the inferior meſenteric vein, but the latter paſs into other veins. Sometimes theſe veins are diſtended with blood from obſtructions, from weakneſs of their coats, or from other cauſes, and what we call the *hæmorrhoids* takes place. In this diſeaſe they are ſometimes ruptured; and the diſcharge of blood which

(x) Anatomiſts have differed with reſpect to this diviſion of the inteſtines.—The method here followed is now generally adopted; but there are authors who allow the name of *cæcum* only to the little appendix, which has likewiſe been called the *vermiform appendix*, from its reſemblance to a worm in ſize and length.

(y) This is not invariably the caſe, for the contents of a glyſter have been found not only to reach the ſmall inteſtines, but to be voided at the mouth. Such inſtances, however, are not common.

(z) Some writers have diſtinguiſhed theſe glands into miliary, lenticular, &c.—Brunner and Peyer were the firſt anatomiſts who deſcribed the glands of the inteſtines, and their deſcriptions were chiefly taken from animals, theſe glandular appearances not ſeeming to have been hitherto ſatisfactorily pointed out in the human ſubject.—It is now pretty generally believed, that the mucus which everywhere lubricates the alimentary canal, is exhaled from the minute ends of arteries; and that theſe extremities firſt open into a hollow veſicle, from whence the depoſited juice of ſeveral branches flows out through one common orifice.

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which consequently follows, has probably occasioned them to be called *hæmorrhoidal veins*.

The nerves of the intestines are derived from the eighth pair.

Sect. VI *Of the Mesentery.*

94. The name of the *mesentery* implies its situation amidst the intestines. It is in fact a part of the peritonæum, being a reduplication (A) of that membrane from each side of the lumbar vertebræ, to which it is firmly attached, so that it is formed of two laminæ, connected to each other by cellular membrane.

The intestines, in their different circumvolutions, form a great number of arches, and the mesentery accompanies them through all these turns; but by being attached only to the hollow part of each arch, it is found to have only a third of the extent of the intestines.

That part of this membrane which accompanies the small intestines is the *mesentery*, properly so called; but those parts of it which are attached to the colon and rectum are distinguished by the names of *meso-colon* and *meso-rectum*.

There are many conglobate glands dispersed through this double membrane, through which the lacteals and lymphatics pass in their way to the thoracic duct. The blood-vessels of the mesentery were described in speaking of the intestines.

This membrane, by its attachment to the vertebræ, serves to keep the intestines in their natural situation. The idea usually formed of the colic called *miserere*, is perfectly erroneous; it being impossible that the intestines can be twisted, as many suppose they are, in that disease, their attachment to the mesentery effectually preventing such an accident—but a disarrangement sometimes takes place in the intestinal canal itself, which is productive of disagreeable and sometimes fatal consequences.—This is by an introsusception of the intestine, an idea of which may be easily formed, by taking the finger of a glove, and involving one part of it within the other.

If inflammation takes place, the stricture in this case is increased, and the peristaltic motion of the intestines (by which is meant the progressive motion of the fæces downwards) is inverted, and what is called the *iliac passion* takes place. The same effects may be occasioned by a descent of the intestine, or of the omentum either with it or by itself, and thus constituting what is called an *hernia* or *rupture;* a term by which in general is meant the falling down or protrusion of any part of the intestine, or omentum, which ought naturally to be contained within the cavity of the belly.

To convey an idea of the manner in which such a descent takes place, it will be necessary to observe, that the lower edge of the tendon of the musculus obliquus externus, is stretched from the fore-part of the os ilium or haunch-bone of the os pubis, and constitutes what is called *Poupart's* or *Fallopius's ligament*, forming an opening, through which pass the great crural artery and vein. Near the os pubis the same tendinous fibres are separated from each other, and form an opening on each side, called the *abdominal ring*, through which the spermatic vessels pass in men, and the ligamenta uteri in women. In consequence of violent efforts, or perhaps of natural causes, the intestines are found sometimes to pass through these openings; but the peritonæum which incloses them when in their natural cavity, still continues to surround them even in their descent. This membrane does not become torn or lacerated by the violence, as might be easily imagined; but its dilatability enables it to pass out with the viscus, which it incloses as it were in a bag, and thus forms what is called the *hernial sac*.

If the hernia be under Poupart's ligament, it is called *femoral;* if in the groin, *inguinal* (B); and *scrotal*, if in the scrotum. Different names are likewise given to the hernia as the contents of the sac differ, whether of omentum only or intestine, or both:—but these definitions more properly belong to the province of surgery.

Sect. VII. *Of the Pancreas.*

The pancreas is a conglomerate gland, placed behind the bottom of the stomach, towards the first vertebra of the loins; shaped like a dog's tongue, with its point stretched out towards the spleen, and its other end extending towards the duodenum. It is about eight fingers breadth in length, two or three in width, and one in thickness. 95.

This viscus, which is of a yellowish colour, somewhat inclined to red, is covered with a membrane which it derives from the peritoneum. Its arteries, which are rather numerous than large, are derived chiefly from the splenic and hepatic, and its veins pass into the veins of the same name.—Its nerves are derived from the intercostal.

The many little glands of which it has been observed the pancreas is composed, all serve to secrete a liquor called the *pancreatic juice*, which in its colour consistence, and other properties, does not seem to differ from the saliva. Each of these glands sends out a little excretory duct, which uniting with others, help to form larger ducts; and all these at last terminate in one common excretory duct (first discovered by Virtsungus in

(A) He who only reads of the reduplication of membranes, will perhaps not easily understand how the peritonæum and pleura are reflected over the viscera in their several cavities; for one of these serves the same purposes in the thorax that the other does in the abdomen. This disposition, for the discovery of which we are indebted to modern anatomists, constitutes a curious part of anatomical knowledge: but the student, unaided by experience, and assisted only by what the limits of this work would permit us to say on the occasion, would probably imbibe only confused ideas of the matter; and it will perfectly answer the present purpose, if he considers the mesentery as a membrane attached by one of its sides to the lumbar vertebræ, and by the other to the intestines.

(B) The hernia congenita will be considered with the male organs of generation, with which it is intimately connected.

in 1642), which runs through the middle of the gland, and is now ufually called *ductus pancreaticus Virtfungi*. This canal opens into the inteftinum duodenum, fometimes by the fame orifice with the biliary duct, and fometimes by a diftinct opening. The liquor it difcharges being of a mild and infipid nature, ferves to dilute the alimentary pulp, and to incorporate it more eafily with the bile.

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SECT. VIII. *Of the Liver.*

96. The liver is a vifcus of confiderable fize, and of a reddifh colour; convex fuperiorly and anteriorly where it is placed under the ribs and diaphragm, and of an unequal furface pofteriorly. It is chiefly fituated in the right hypochondrium, and under the falfe ribs; but it likewife extends into the epigaftric region, where it borders upon the ftomach. It is covered by a production of the peritoneum, which ferves to attach it by three of its reduplications to the falfe ribs. Thefe reduplications are called *ligaments*, though very different in their texture from what are called by the fame name in other parts of the body. The umbilical cord, too, which in the fœtus is pervious, gradually becomes a fimple ligament after birth; and by paffing to the liver, ferves likewife to fecure it in its fituation.

At the pofterior part of this organ where the umbilical veffels enter, it is found divided into two lobes. Of thefe, the largeft is placed in the right hypocondrium; the other, which covers part of the ftomach, is called the *little lobe*. All the veffels which go to the liver pafs in at the fiffure we have mentioned; and the production of the peritoneum, which invefts the liver, was defcribed by Gliffon, an Englifh anatomift, as accompanying them in their paffage, and furrounding them like a glove; hence this production has been commonly known by the name of *capfula of Gliffon*: but it appears to be chiefly a continuation of the cellular membrane which covers the vena porta ventralis.

The liver was confidered by the ancients as an organ deftined to prepare and perfect the blood; but later difcoveries have proved, that this opinion was wrong, and that the liver is a glandular fubftance formed for the fecretion of the bile.

The blood is conveyed to the liver by the hepatic artery and the vena portæ. This is contrary to the mode of circulation in other parts, where veins only ferve to carry off the redundant blood: but in this vifcus the hepatic artery, which is derived from the cæliac, is principally deftined for its nourifhment; and the vena porta, which is formed by the union of the veins from moft of the abdominal vifcera, furnifhes the blood from which the bile is chiefly to be feparated: fo that thefe two feries of veffels ferve very diftinct purpofes. The vena porta, as it is ramified through the liver, performs the office both of a vein and an artery; for like the former it returns the blood from the extremities of arteries, while as the latter it prepares it for fecretion.

The nerves of the liver are branches of the intercoftal and par vagum. The bile, after being feparated from the mafs of blood, in a manner of which mention will be made in another place, is conveyed out of this organ by very minute excretory ducts, called *pori biliarii*; thefe uniting together like the excretory ducts in the pancreas, gradually form larger ones, which at length terminate in a confiderable channel called *ductus hepaticus*.

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SECT. IX. *Of the Gall-bladder.*

The gall-bladder is a little membranous bag, fhaped like a pear, and attached to the pofterior and almoft inferior part of the great lobe of the liver. 97.

It has two tunics; of which the exterior one is a production of the peritonæum. The interior, or villous coat, is fupplied with a mucus that defends it from the acrimony of the bile. Thefe two coverings are intimately connected by means of cellular membrane, which from its firm gliftening appearance has generally been fpoken of as a mufcular tunic.

The gall-bladder is fupplied with blood-veffels from the hepatic arteries. Thefe branches are called the *cyftic arteries*, and the cyftic veins carry back the blood.

Its nerves are derived from the fame origin as thofe of the liver.

The neck of the gall-bladder is continued in the form of a canal called *ductus cyfticus*, which foon unites with the ductus hepaticus we defcribed as the excretory duct of the liver; and forming one common canal, takes the name of *ductus coledochus communis*, through which both the cyftic and hepatic bile are difcharged into the duodenum. This canal opens into the inteftine in an oblique direction, firft paffing through the exterior tunic, and then piercing the other coats after running between each of them a very little way. This œconomy ferves two ufeful purpofes;—to promote the difcharge of bile and to prevent its return.

The bile may be defined to be a natural liquid foap, fomewhat unctuous and bitter, and of a yellowifh colour, which eafily mixes with water, oil, and vinous fpirits, and is capable of diffolving refinous fubftances. From fome late experiments made by M. Cadet *, it appears to be formed of an animal oil, combined with the alkaline bafe of fea-falt, a falt of the nature of milk, and a calcareous earth which is flightly ferruginous. 98 Of the bile.

* Mem. de l'Acad. des Sciences, 1767.

Its definition feems fufficiently to point out the ufes for which it is intended (c). It blends the alimentary mafs, by dividing and attenuating it; corrects the too great difpofition to acefcency, which the aliment acquires in the ftomach; and, finally, by its acrimony, tends to excite the periftaltic motion of the inteftines.

After what has been faid, it will be conceived that there are two forts of bile; one of which is derived immediately from the liver through the hepatic duct, and the other from the gall-bladder. Thefe two biles, however, do not effentially differ from each other. The hepatic bile indeed is milder, and more liquid than the cyftic, which is conftantly thicker and yellower; and

(c) The ancients, who were not acquainted with the real ufe of the liver, confidered the bile as an excrementitious and ufelefs fluid.

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and by being bitterer, ſeems to poſſeſs greater activity than the other.

Every body knows the ſource of the hepatic bile, that it is ſecreted from the maſs of blood by the liver; but the origin of the cyſtic bile has occaſioned no little controverſy amongſt anatomical writers. There are ſome who contend, that it is ſeparated in the ſubſtance of the liver, from whence it paſſes into the gall-bladder through particular veſſels. In deer, and in ſome other quadrupeds, as well as in ſeveral birds and fiſhes, there is an evident communication, by means of particular veſſels, between the liver and the gall-bladder. Bianchi, Winſlow, and others, have aſſerted the exiſtence of ſuch veſſels in the human ſubject, and named them *hepaticyſtic ducts;* but it is certain that no ſuch ducts exiſt.—In obſtructions of the cyſtic duct, the gall-bladder has been found ſhrivelled and empty: ſo that we may conſider the gall-bladder as a reſervoir of hepatic bile; and that it is an eſtabliſhed fact, that the whole of the bile contained in the gall-bladder is derived from the liver; that it paſſes from the hepatic to the cyſtic duct, and from that to the gall-bladder. The difference in the colour, conſiſtence, and taſte of the bile, is merely the conſequence of ſtagnation and abſorption. When the ſtomach is diſtended with aliment, this reſervoir undergoes a certain degree of compreſſion, and the bile paſſes out into the inteſtinal canal; and in the efforts to vomit, the gall-bladder ſeems to be conſtantly affected, and at ſuch times diſcharges itſelf of its contents.

Sometimes the bile concretes in the gall-bladder, ſo as to form what are called *gall-ſtones* (D). When theſe concretions paſs into the cyſtic duct, they ſometimes occaſion exquiſite pain, by diſtending the canal in their way to the duodenum; and by lodging in the ductus choledochus communis, and obſtructing the courſe of the bile, this fluid will be abſorbed, and by being carried back into the circulation occaſion a temporary jaundice.

SECT. X. *Of the Spleen.*

99. THE ſpleen is a ſoft and ſpongy viſcus, of a bluiſh colour, and about five or ſix fingers breadth in length, and three in width, ſituated in the left hypochondrium, between the ſtomach and the falſe ribs. That ſide of it which is placed on the ſide of the ribs is convex; and the other, which is turned towards the ſtomach, is concave.

The ſplenic artery, which is a branch from the cæliac, ſupplies this viſcus with blood, and a vein of the ſame name carries it back into the venæ porta.

Its nerves are derived from a particular plexus called the *ſplenic*, which is formed by branches of the intercoſtal nerve, and by the eighth pair, or par vagum.

The ancients, who ſuppoſed two ſorts of bile, conſidered the ſpleen as the receptacle of what they called *atra bilis*. Havers, who wrote profeſſedly on the bones, determined its uſe to be that of ſecreting the ſynovia; and the late Mr Hewſon imagined, that it concurred with the thymus and lymphatic glands of the body in forming the red globules of the blood. All theſe opinions ſeem to be equally fanciful. The want of an excretory duct has occaſioned the real uſe of this viſcus to be ſtill doubtful. Perhaps the blood undergoes ſome change in it, which may aſſiſt in the preparation of the bile. This is the opinion of the generality of modern phyſiologiſts; and the great quantity of blood with which it is ſupplied, together with the courſe of its veins into the vena portæ, ſeem to render this notion probable.

SECT. XI. *Of the Glandulæ Renales, Kidneys, and Ureters.*

THE glandulæ renales, which were by the ancients ſuppoſed to ſecrete the atra bilis, and by them named *capſulæ atrabilares*, are two flat bodies of an irregular figure, one on each ſide between the kidney and the aorta. 100.

In the fœtus they are as large as the kidneys: but they do not increaſe afterwards in proportion to thoſe parts; and in adults and old people they are generally found ſhrivelled, and much waſted. They have their arteries and veins. Their arteries uſually ariſe from the ſplenic or the emulgent, and ſometimes from the aorta; and their veins go to the neighbouring veins, or to the vena cava. Their nerves are branches of the intercoſtal.

The uſe of theſe parts is not yet perfectly known. In the fœtus the ſecretion of urine muſt be in a very ſmall quantity, and a part of the blood may perhaps then paſs through theſe channels, which in the adult is carried to the kidneys to ſupply the matter of urine.

The kidneys are two in number, ſituated one on the right and the other on the left ſide in the lumbar region, between the laſt falſe rib and the os ilium, by the ſides of the vertebræ. Each kidney in its figure reſembles a ſort of bean, which from its ſhape is called *kidney-bean*. The concave part of each kidney is turned towards the aorta and vena cava aſcendens. They are ſurrounded by a good deal of fat, and receive a coat from the peritonæum; and when this is removed, a very fine membrane is found inveſting their ſubſtance and the veſſels which ramify through them. 101 Kidneys.

Each kidney has a conſiderable artery and vein, which are called the *emulgent*. The artery is a branch from the aorta, and the vein paſſes into the vena cava. Their nerves, which every where accompany the blood-veſſels, ariſe from a conſiderable plexus, which is derived from the intercoſtal.

In each kidney, which in the adult is of a pretty firm texture, there are three ſubſtances to be diſtinguiſhed (E). The outer part is glandular or cortical, beyond

(D) Theſe concretions ſometimes remain in the gall-bladder without cauſing any uneaſineſs. Dr Heberden relates, that a gall-ſtone weighing two drams was found in the gall-bladder of the late Lord Bath, though he had never complained of the jaundice, nor of any diſorder which he could attribute to that cauſe. *Med. Tranſ.* Vol. ii.

(E) The kidneys in the fœtus are diſtinctly lobulated; but in the adult they become perfectly firm, ſmooth, and regular.

Of the Abdomen. beyond this is the vascular or tubular substance, and the inner part is papillary or membranous.

It is in the cortical part of the kidney that the secretion is carried on; the urine being here received from the minute extremities of the capillary arteries, is conveyed out of this cortical substance by an infinite number of very small cylindrical canals or excretory vessels, which constitute the tubular part. These tubes, as they approach the inner substance of the kidney, gradually unite together; and thus forming larger canals, at length terminate in ten or twelve little protuberances called *papillæ*, the orifices of which may be seen without the assistance of glasses. These papillæ open into a small cavity or reservoir called the *pelvis of the kidney*, and formed by a distinct membranous bag which embraces the papillæ. From this pelvis the urine is conveyed through a membranous canal which passes out from the hollow side of the kidney, a little below the blood vessels, and is called *ureter*.

101 Ureters. The ureters are each about as large as a common writing-pen. They are somewhat curved in their course from the kidneys, like the letter *f*, and at length terminate in the posterior and almost inferior part of the bladder, at some distance from each other. They pass into the bladder in the same manner as the ductus choledochus communis passes into the intestinum duodenum, not by a direct passage, but by an oblique course between the two coats; so that the discharge of urine into the bladder is promoted, whilst its return is prevented. Nor does this mode of structure prevent the passage of fluids only from the bladder into the ureters, but likewise air:—for air thrown into the bladder inflates it, and it continues to be distended if a ligature is passed round its neck; which seems to prove sufficiently that it cannot pass into the ureters.

Sect XII. *Of the Urinary Bladder.*

102. The urinary bladder is a membranous and muscular bag of an oblong roundish shape, situated in the pelvis, between the os pubis and intestinum rectum in men, and between the os pubis and uterus in women. Its upper and widest part is usually called the *bottom*, its narrower part the *neck* of the bladder; the former only is covered by the peritonæum.

The bladder is formed of three coats, connected together by means of cellular membrane. The external or peritonæal, is only a partial one, covering the upper and back part of the bladder. The middle, or muscular coat, is composed of irritable, and of course muscular fibres, which are most collected around the neck of the bladder, but not so as to form a distinct muscle, or sphincter, as the generality of anatomists have hitherto supposed.

The inner coat, though much smoother, has been said to resemble the villous tunic of the intestines, and like that is provided with a mucus, which defends it against the acrimony of the urine.

103 Of the urine. It will be easily conceived from what has been said, that the kidneys are two glandular bodies, thro' which a saline and excrementitious fluid called *urine* is constantly filtering from the mass of blood.

While only a small quantity of urine is collected in the bladder, it excites no kind of uneasiness; but when a greater quantity is accumulated, so that the bladder is distended in a certain degree, it excites in us a certain sensation, which brings on as it were a voluntary contraction of the bladder to promote its discharge.—But this contraction is not effected by the muscular fibres of the bladder alone: for all the abdominal muscles contract in obedience to our will, and press downwards all the viscera of the lower belly; and these powers being united, at length overcome the resistance of the fibres surrounding the neck of the bladder, which dilates and affords a passage to the urine through the urethra.

The frequency of this evacuation depends on the quantity of urine secreted; on the degree of acrimony it possesses; on the size of the bladder, and on its degree of sensibility.

The urine varies much in its colour and contents. These varieties depend, on age, sex, climate, diet, and other circumstances. In infants it is generally a clear watery fluid, without smell or taste. As we advance in life, it acquires more colour and smell, and becomes more impregnated with salts. In old people it becomes still more acrid and fetid.

In a healthy state it is nearly of a straw colour.—After being kept for some time, it deposites a tartarous matter, which is found to be composed chiefly of earth and salt, and soon incrusts the sides of the vessel in which it is contained. While this separation is taking place, appearances like minute fibres or threads of a whitish colour, may be seen in the middle of the urine, and an oily scum observed floating on its surface. So that the most common appearances of the urine are sufficient to ascertain that it is a watery substance, impregnated with earthy, saline, and oily particles.

The urine is not always voided of the same colour and consistence; for these are found to depend on the proportion of its watery part to that of its other constituent principles.—Its colour and degree of fluidity seem to depend on the quantity of saline and inflammable particles contained in it: so that an increased proportion of those parts will constantly give the urine a higher colour, and add to the quantity of sediment.

The variety in the appearance of the urine, depends on the nature and quantity of solid and fluid aliment we take in; and it is likewise occasioned by the different state of the urinary vessels, by which we mean the channels through which it is separated from the blood, and conveyed through the pelvis into the ureters. The causes of calculous concretions in the urinary passages, are to be looked for in the natural constitution of the body, mode of life, &c.

It having been observed, that after drinking any light wine or spa water, it very soon passed off by urine, it has been supposed by some, that the urine is not altogether conveyed to the bladder by the ordinary course of circulation, but that there must certainly exist some other shorter means of communication, perhaps by certain vessels between the stomach and the bladder, or by a retrograde motion in the lymphatics. But it is certain, that if we open the belly of a dog, press out the urine from the bladder, pass a ligature round the emulgent arteries, and then sew up the abdomen, and give him even the most diuretic liquor to drink, the stomach and other channels will be distended

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ed with it, but not a drop of urine will be found to have paffed into the bladder; or the fame thing happens when a ligature is thrown round the two ureters. This experiment then feems to be a fufficient proof, that all the urine we evacuate, is conveyed to the kidneys through the emulgent arteries, in the manner we have defcribed.—It is true, that wine and other liquors promote a fpeedy evacuation of urine: but the difcharge feems to be merely the effect of the ftimulus they occafion; by which the bladder and urinary parts are folicited to a more copious difcharge of the urine, which was before in the body, and not immediately of that which was laft drank; and this increafed difcharge, if the fupply is kept up, will continue: nor will this appear wonderful, if we confider the great capacity of the veffels that go to the kidneys; the conftant fupply of frefh blood that is effential to health; and the rapidity with which it is inceffantly circulated through the heart to all parts of the body.

Sect. XIII. *Of Digeftion.*

102. We are now proceeding to fpeak of *digeftion*, which feems to be introduced in this place with propriety, after a defcription of the abdominal vifcera, the greater part of which contribute to this function. By *digeftion* is to be underftood, the changes the aliment undergoes for the formation of chyle:—thefe changes are effected in the mouth, ftomach, and fmall inteftines.

The mouth, of which every body has a general knowledge, is the cavity between the two jaws, formed anteriorly and laterally by the lips, teeth, and cheeks, and terminating pofteriorly in the throat.

The lips and cheeks are made up of fat and mufcles, covered by the cuticle, which is continued over the whole inner furface of the mouth, like a fine and delicate membrane.—Befide this membrane, the infide of the mouth is furnifhed with a fpongy and very vafcular fubftance called the *gums*, by means of which the teeth are fecured in their fockets. A fimilar fubftance covers the roof of the mouth, and forms what is called the *velum pendulum palati*, which is fixed to the extremity of the arch formed by the offa maxillaria and offa palati, and terminates in a foft, fmall, and conical body, named *uvula;* which appears, as it were, fufpended from the middle of the arch over the bafis of the tongue.

The velum pendulum palati performs the office of a valve between the cavity of the mouth and the pharynx, being moved by feveral mufcles (F).

The tongue is compofed of feveral mufcles (G) which enable it to perform a variety of motions for the articulation of the voice; for the purpofes of maftication; and for conveying the aliment into the pharynx. Its upper part is covered with papillæ, which conftitute the organ of tafte, and are eafily to be diftinguifhed; it is covered by the fame membrane that lines the infide of the mouth, and which makes at its inferior part towards its bafis a reduplication called *frænum*.

Pofteriorly, under the velum palati, and at the bafis of the tongue, is the pharynx; which is the beginning of the œfophagus, ftretched out every way, fo as to refemble the top of a funnel, through which the aliment paffes into the ftomach.

The mouth has a communication with the noftrils at its pofterior and upper part; with the ears, by the Euftachian tubes; with the lungs, by means of the larynx; and with the ftomach, by means of the œfophagus.

The pharynx is conftantly moiftened by a fluid, fecreted by two confiderable glands called the *tonfils*, one on each fide of the velum palati. Thefe glands, from their fuppofed refemblance to almonds, have likewife been called *amygdalus*.

The mouth is moiftened by a confiderable quantity of faliva. This fluid is derived from the *parotid glands;* a name which by its etymology points out their fituation to be near the ears. They are two in number, one on each fide under the os malæ: and they are of the conglomerate kind; being formed of many fmaller glands, each of which fends out a very fmall excretory duct, which unites with the reft, to form one common channel, that runs over the cheek, and piercing the buccinator mufcle, opens into the mouth on each fide, by an orifice into which a briftle may be eafily introduced. —Befides thefe, the maxillary glands, which are placed near the inner furface of the angle of the lower jaw on each fide; the fublingual glands, which are fituated at the root of the tongue; the glands of the palate, which are feated in the velum palati; and thofe of the cheeks, lips, &c. together with many other lefs confiderable ones,—pour the faliva into the mouth through their feveral excretory ducts.

The faliva, like all the other humours of the body, is found to be different in different people: but in general, it is a limpid and infipid fluid, without fmell in healthy fubjects; and thefe properties would feem to prove, that it contains very few faline or inflammable particles.

The ufes of the faliva feem to be to moiften and lubricate the mouth, and to affift in reducing the aliment into a foft pulp before it is conveyed into the ftomach.

The variety of functions which are conftantly performed by the living body, muft neceffarily occafion a continual wafte and diffipation of its feveral parts. A great quantity is every day thrown off by the infenfible perfpiration and other difcharges; and were not thefe loffes conftantly recruited by a frefh fupply of chyle, the body would foon effect its own diffolution. But nature has very wifely favoured us with organs fitted to produce fuch a fupply; and has at the fame time endued us with the fenfations of hunger and thirft, that our attention may not be diverted from the neceffary bufinefs of nutrition. The fenfation of hunger is univerfally 103

Of hunger and thirft.

(F) Thefe are the circumflexus palati, levator palati mollis, palato-pharyngæus conftrictor ifthmi faucium, and azygos uvulæ. See page 708.

(G) Thefe are, the genio-gloffus, hyo-gloffus, lingualis, and ftylo-gloffus. See page 708.

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versally known; but it would perhaps be difficult to describe it perfectly in words. It may, however, be defined to be a certain uneasy sensation in the stomach, which induces us to wish for solid food; and which likewise serves to point out the proper quantity, and time for taking it. In describing the stomach, mention was made of the gastric juice, as every where lubricating its inner coat. This humour mixes itself with the aliment in the stomach, and helps to prepare it for its passage into the intestines; but when the stomach is perfectly empty, this same fluid irritates the coats of the stomach itself, and produces the sensation of hunger.

A certain proportion of liquid aliment is required to assist in the process of digestion, and to afford that moisture to the body, of which there is such a constant dissipation.—Thirst induces us to take this necessary supply of drink; and the seat of this sensation is in the tongue, fauces, and œsophagus, which from their great sensibility are required to be kept moist: for though the fauces are naturally moistened by the mucus and salival juices; yet the blood, when deprived of its watery part or rendered acrimonious by any natural causes, never fails particularly to affect these parts, and the whole alimentary canal, and to occasion thirst.—This is the common effect of fevers and of hard labour, by both which too much of the watery part of the blood is dissipated.

104 Of mastication and deglutition.

It has been observed, that the aliment undergoes some preparation in the mouth before it passes into the stomach; and this preparation is the effect of mastication. In treating of the upper and lower jaws, mention was made of the number and arrangement of the teeth. The upper jaw was described as being immoveable; but the lower jaw was spoken of as being capable of elevation and depression, and of a grinding motion. The aliment, when first carried into the mouth, is pressed between the teeth of the two jaws by a very strong and frequent motion of the lower jaw; and the tongue and the cheeks assisting in this process, continue to replace the food between the teeth till it is perfectly divided, and reduced to the consistence of pulp. The incisores and canini divide it first into smaller pieces, but it is between the surfaces of the dentes molares by the grinding motion of the jaw that the mastication is completed.

During this process, the salival glands being gently compressed by the contraction of the muscles that move the lower jaw, pour out their saliva: this helps to divide and break down the food, which at length becomes a kind of pulp, and is then carried over the basis of the tongue into the fauces. But to effect this passage into the œsophagus, it is necessary that the other openings which were mentioned as having a communication with the mouth as well as the pharynx, should be closed; that none of the aliment, whether solid or liquid, may pass into them, whilst the pharynx alone is dilated to receive it:—And such a disposition actually takes place in a manner we will endeavour to describe.

The trachea arteria, or windpipe, through which the air is conveyed to the lungs, is placed before the œsophagus—in the act of swallowing; therefore, if the *larynx* (for so the upper part of the trachea is called) is not closed, the aliment will pass into it in its way to the œsophagus. But this is prevented by a small and very elastic cartilage, called *epiglottis*, which is attached only to the fore-part of the larynx; so that the food in its passage to the œsophagus presses down this cartilage, which then covers the glottis or opening of the larynx; and at the same time the velum palati being capable of some degree of motion, is drawn backwards by its muscles, and closes the openings into the nose and the Eustachian tubes.—This, however, is not all. The larynx, which being composed of cartilaginous rings cannot fail in its ordinary state to compress the membranous canal of the œsophagus, is in the act of deglutition carried forwards and upwards by muscles destined for that purpose; and consequently drawing the fore-part of the pharynx with it, that opening is fully dilated. When the aliment has reached the pharynx, its descent is promoted by its own proper weight, and by the muscular fibres of the œsophagus, which continue to contract from above downwards, until the aliment has reached the stomach. That these fibres have no inconsiderable share in deglutition, any person may experience, by swallowing with his head downwards, when the descent of the aliment cannot possibly be effected by its weight.

It is necessary that the nostrils and the lungs should communicate with the mouth, for the purposes of speech and respiration: but if the most minute part of our food happens to be introduced into the trachea, it never fails to produce a violent cough, and sometimes the most alarming symptoms. This is liable to happen when we laugh or speak in the act of deglutition: the food is then said to have passed the wrong way. And indeed this is not improperly expressed: for death would soon follow, if the quantity of aliment introduced into the trachea should be sufficient to obstruct the respiration only during a very short time; or if the irritating particles of food should not soon be thrown up again by means of the cough, which in these cases very seasonably increases in proportion to the degree of irritation.

If the velum palati did not close the passage to the nostrils, deglutition would be performed with difficulty, and perhaps not at all; for the aliment would return through the nose, as is sometimes the case in drinking. Children, from a deficiency in this velum palati, have been seen to die a few hours after birth; and they who from disease or any other causes have not this part perfect, swallow with difficulty.

The aliment, after having been sufficiently divided by the action of the teeth, and attenuated by the saliva, is received into the stomach, where it is destined to undergo a more considerable change.

The properties of the aliment not being much altered at its first entrance into the stomach, and before it is thoroughly blended with the gastric juice, is capable of irritating the inner coat of the stomach to a certain degree, and occasions a contraction of its two orifices.—In this membranous bag, surrounded by the abdominal viscera, and with a certain degree of natural heat, the aliment undergoes a constant agitation by means of the abdominal muscles and of the diaphragm, and likewise by a certain contraction or expansion of the muscular fibres of the stomach itself. By this motion, every part of the food is exposed to the action of the gastric juice, which gradually divides and attenuates it, and prepares it for its passage into the intestines.

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Some obfervations lately publifhed by Mr Hunter in the Philofophical Tranfactions, tend to throw confiderable light on the principles of digeftion. There are few dead bodies in which the ftomach, at its great end, is not found to be in fome degree digefted (H). Animals, or parts of animals, poffeffed of the living principle, when taken into the ftomach, are not in the leaft affected by the action of that vifcus; but the moment they lofe the living principle, they become fubject to its digeftive powers. This feems to be the cafe with the ftomach, which is enabled to refift the action of its juices in the living body: but when deprived of the living principle, it is then no longer able to refift the powers of that menftruum, which it had itfelf formed for the digeftion of its contents; the procefs of digeftion appearing to be continued after death. This is confirmed by what happens in the ftomachs of fifhes: They frequently fwallow, without maftication, fifh which are larger than the digefting parts of their ftomach can contain; and in fuch cafes, that part which is taken into the ftomach is more or lefs diffolved, while that part which remains in the œfophagus is perfectly found; and here, as well as in the human body, the digefting part of the ftomach is often reduced to the fame ftate as the digefted part of the food. Thefe appearances tend to prove, that digeftion is not effected by a mechanical power, by contractions of the ftomach, or by heat; but by a fluid fecreted in the coats of the ftomach, which is poured into its cavity, and there animalizes the food, or affimilates it to the nature of blood.

* Hift. de l'Academie royale des Sciences, &c. pour 1784. mem. 15.

From fome late experiments by M. Sage *, it appears, that inflammable air has the property of deftroying and diffolving the animal texture: And as we fwallow with the fubftances which ferve us for food a great quantity of atmofpherical air, M. Sage thinks it poffible, that dephlogifticated, which is its principle, may be converted in the ftomach into inflammable air, or may modify into inflammable air a portion of the oily fubftance which is the principle of aliments. In this cafe, would not the inflammable air (he afks), by diffolving our food, facilitate its converfion into chyle?

Be this as it may, the food, after having remained one, two, or three hours in the ftomach, is converted into a greyifh pulp, which is ufually called *chymus*, a word of Greek etymology, fignifying *juice*, and fome few milky or chylous particles begin to appear.—But the term of its refidence in this bag is proportioned to the nature of the aliment, and to the ftate of the ftomach and its juices. The thinner and more perfectly digefted parts of the food pafs by a little at a time into the duodenum, through the pylorus, the fibres of which relax to afford it a paffage; and the groffer and lefs digefted particles remain in the ftomach, till they acquire a fufficient fluidity to pafs into the inteftines, where the nature of the *chymus* is perfectly changed. The bile and pancreatic juice which flow into the duodenum, and the mucus, which is every where diftilled from the furface of the inteftines, mix themfelves with the alimentary pulp, which they ftill farther attenuate and diffolve, and into which they feem to infufe new properties.

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Two matters very different from each other in their nature and deftination, are the refult of this combination.—One of thefe, which is compofed of the liquid parts of the aliment, and of fome of its more folid particles, extremely divided and mixed with the juices we have defcribed, conftitutes a very mild, fweet, and whitifh fluid, refembling milk, and diftinguifhed by the name of *chyle*. This fluid is abforbed by the lacteal veins, which convey it into the circulation, where, by being affimilated into the nature of blood, it affords that fupply of nutrition, which the continual wafte of the body is found to require.—The other, is the remains of the alimentary mafs deprived of all its nutritious particles, and containing only fuch parts as were rejected by the abforbing mouths of the lacteals. This groffer part, called the *fæces*, paffes on through the courfe of the inteftines, to be voided at the anus, as will be explained hereafter; for this procefs in the œconomy cannot be well underftood till the motion of refpiration has been explained. But the ftructure of the inteftines is a fubject which may be properly defcribed in this place, and deferves to be attended to.

It has been already obferved, that the inteftinal canal is five or fix times as long as the body, and that it forms many circumvolutions in the cavity of the abdomen, which it traverfes from the right to the left, and again from the left to the right; in one place defcending, and in another extending itfelf upwards. It was noticed likewife, that the inner coat of the inteftines, by being more capacious than their exterior tunics, formed a multitude of plaits placed at a certain diftance from each other, and called *valvulæ conniventes*. Now this difpofition will be found to afford a farther proof of that divine wifdom, which the anatomift and phyfiologift cannot fail to difcover in all their purfuits. —For if the inteftinal canal was much fhorter than it naturally is; if inftead of the prefent circumvolutions it paffed in a direct courfe from the ftomach; and if its inner furface was fmooth and deftitute of valves; the aliment would confequently pafs with great rapidity to the anus, and fufficient time would be wanting to affimilate the chyle, and for the neceffary abforption of it into the lacteals: fo that the body would be deprived of the fupply of nutrition, which is fo effential to life and health; but the length and circumvolutions of the inteftines, the inequality of their internal furface,

(H) The Abbé Spallanzani, who has lately written upon digeftion, finds, from a variety of experiments, made upon quadrupeds, birds, and fifhes, that digeftion goes on for fome time after death, though far lefs confiderable than in living animals; but heat is neceffary in many animals, or at leaft promotes it in a much greater degree. He found alfo, that when the ftomach was cut out of the body, it had fomewhat of the power of digeftion, though this was trifling when compared with that which took place when the ftomach was left in the body. In not one of the animals was the great curvature of the ftomach diffolved, or much eroded after death. There was often a little erofion, efpecially in different fifhes; in which, when he had cleared the ftomach of its contents, the internal coat was wanting. In other animals there was only a flight excoriation; and the injury

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face, and the course of the aliment through them, all concur to perfect the separation of the chyle from the fæces, and to afford the necessary nourishment to the body.

Sect. XIV. *Of the Course of the Chyle, and of the Lymphatic System.*

105. An infinite number of very minute vessels, called the *lacteal veins*, arise like net-work from the inner surface of the intestines, (but principally from the *jejunum* and *ileum*), which are destined to imbibe the nutritious fluid or chyle. These vessels, which were discovered by Asellius in 1622 (1), pass obliquely through the coats of the intestine, and running along the mysentery, unite as they advance, and form larger branches, all of which pass through the mesenteric or conglobate glands, which are very numerous in the human subject. As they run between the intestines and these glands, they are styled *venæ lacteæ primi generis*: but after leaving these glands, they are found to be less numerous, and being increased in size, are then called *venæ lacteæ secundi generis*, which go to deposite their contents in the *thoracic duct*, through which the chyle is conveyed into the blood.

This *thoracic duct* begins about the lower part of the first vertebra lumborum, from whence it passes up by the side of the aorta, between that and the vena azygos, close to the vertebræ, being covered by the pleura. Sometimes it is found divided into two branches; but they usually unite again into one canal, which opens into the left subclavian vein, after having run a little way in an oblique course between its coats. The subclavian vein communicates with the vena cava, which passes to the right auricle of the heart.

The lower part of this duct being usually larger than any other part of it, has been named *receptaculum chyli*, or *Pecquet's receptacle*, in honour of the anatomist who first discovered it in 1651. In some quadrupeds, in turtle and in fish, this enlargement * is more considerable in proportion to the size of the duct, than it usually is in the human subject, where it is not commonly found large enough to merit the name of *receptaculum*.

* Hewson's Exp. Inq. Part II.

Opportunities of observing the lacteals in the human subject do not often occur; but they may be easily demonstrated in a dog or any other quadruped that is killed two or three hours after feeding upon milk, for then they appear filled with white chyle.

But these *lacteals* which we have described, as passing from the intestines through the mesentery to the thoracic duct, compose only a part of a system of vessels which perform the office of *absorption*, and which constitute, with their common trunk the thoracic duct, and the conglobate glands that are dispersed through the body, what may be styled the *lymphatic system*. So that what is said of the structure of one of these series of vessels may very properly be applied to that of the other.

106 Lymphatic vessels.

The *lymphatic veins* (K) are minute pellucid tubes, which, like the lacteals, direct their course towards the centre of the body, where they pour a colourless fluid into the thoraic duct. The lymphatics from all the lower parts of the body gradually unite as they approach this duct, into which they enter by three or four very large trunks, that seem to form the lower extremity of this canal, or *receptaculum chyli*, which may be considered as the great trunk of the lymphatic system. The lacteals open into it near the same place; and the lymphatics, from a large share of the upper parts of the body, pour their lymph into different parts of this duct as it runs upwards, to terminate in the left subclavian vein. The lymphatics from the right side of the neck, thorax, and right arm, &c. terminate in the right subclavian vein.

As the lymphatics commonly lie close to the large blood-vessels, a ligature passed round the crural artery in a living animal, by including the lymphatics, will occasion a distension of these vessels below the ligature, so as to demonstrate them with ease; and a ligature passed round the thoracic duct, instantly after killing an animal, will, by stopping the course of its contents into

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jury in all of them was at the inferior part, or great curvature. The coats of the stomach suffer less after death than flesh, or part of the stomach of similar animals put into it: The author assigns as a reason for this, that these bodies are invested on all sides by the gastric fluid, whereas it only acts on the internal surface of the stomach.

(1) We are informed by Galen, that the lacteals had been seen in kids by Erasistratus, who considered them as arteries carrying a milky fluid: but from the remote time in which he lived, they do not seem to have been noticed till they were discovered in a living dog by Asellius, who denominated them *lacteals*, and considered them as serving to convey the chyle from the intestines to the liver; for before the discovery of the thoracic duct, the use of the liver was universally supposed to be that of converting the chyle into blood. But the discovery of the thoracic duct by Pecquet, not long after, corrected this error. Pecquet very candidly confesses, that his discovery accidentally arose from his observing a white fluid, mixed with the blood, flowing out of the vena cava, after he had cut off the heart of a living dog; which he suspected to be chyle, and afterwards traced to its source from the thoracic duct: This duct had been seen near an hundred years before in a horse by Eustachius, who speaks of it as a vein of a particular structure, but without knowing any thing of its termination or use.

(K) The arteries in their course through the body becoming gradually too minute to admit the red globules of the blood, have then been styled *capillary* or *lymphatic arteries*. The vessels which are here described as constituting the lymphatic system, were at first supposed to be continued from those arteries, and to convey back the lymph, either into the red veins or the thoracic duct; the office of absorption having been attributed to the *red veins*. But we know that the *lymphatic veins* are not continuations of the *lymphatic arteries*, but that they constitute the *absorbent system*. There are still, however, some very respectable names among the anatomists of the present age, who contend, that the red veins act likewise as absorbents:—but it seems to have been clearly proved, that the red veins do absorb nowhere but in the cavernous cells of the penis, the erection of which is occasioned by a distension of those cells with arterial blood.

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into the subclavian vein, distend not only the lacteals, but also the lymphatics in the abdomen and lower extremities, with their natural fluids (L).

The coats of these vessels are too thin to be separated from each other; but the mercury they are capable of sustaining, proves them to be very strong; and their great power of contraction, after undergoing considerable distension, together with the irritability with which Baron Haller found them to be endued *, seems to render it probable, that, like the blood-vessels, they have a muscular coat.

* *Sur le movement du sang.* Ex. 295, 298.

The lymphatics are nourished after the same manner as all the other parts of the body. For even the most minute of these vessels are probably supplied with still more minute arteries and veins. This seems to be proved by the inflammation of which they are susceptible; and the painful swellings which sometimes take place in lymphatic vessels, prove that they have nerves as well as blood-vessels.

Both the lacteals, lymphatics, and thoracic duct, are furnished with valves, which are much more common in these vessels than in the red veins. These valves are usually in pairs, and serve to promote the course of the chyle and lymph towards the thoracic duct, and to prevent its return. Mention has been made of the glands, through which the lacteals pass in their course through the mesentery; and it is to be observed, that the lymphatics pass through similar glands in their way to the thoracic duct. These glands are all of the conglobate kind, but the changes which the chyle and lymph undergo in their passage through them, have not yet been ascertained.

The *lymphatic vessels* begin from surfaces and cavities in all parts of the body as *absorbents*. This is a fact now universally allowed; but how the fluids they absorb are poured into those cavities, is a subject of controversy. The contents of the abdomen, for instance, were described as being constantly moistened by a very thin watery fluid. The same thing takes place in the pericardium, pleura, and all the other cavities of the body, and this watery fluid is the *lymph*. But whether it is exhaled into those cavities through the minute ends of arteries, or transuded through their coats, are the points in dispute. We cannot here be permitted to relate the many ingenious arguments that have been advanced in favour of each of these opinions; nor is it perhaps of consequence to our present purpose to enter into the dispute. It will be sufficient if the reader can form an idea of what the lymph is, and of the manner in which it is absorbed.

The *lymph*, from its transparency and want of colour, would seem to be nothing but water; and hence the first discoverers of these vessels styled them *ductus aquosi*: but experiments prove, that the lymph of an healthy animal coagulates by being exposed to the air, or a certain degree of heat, and likewise by being suffered to rest; seeming to agree in this property with that part of the blood called the *coagulable lymph*.—This property of the lymph leads to determine its use, in moistening and lubricating the several cavities of the body in which it is found; and for which, by its gelatinous principle, it seems to be much better calculated than a pure and watery fluid would be, for such it has been supposed to be by some anatomists.

The mouths of the *lymphatics* and *lacteals*, by acting as capillary tubes, seem to absorb the *lymph* and *chyle* somewhat in the same manner as a capillary tube of glass, when put into a bason of water, is enabled to attract the water into it to a certain height: but it is probable that they likewise possess a living power, which assists in performing this office. In the human body the *lymph*, or the *chyle*, is probably conveyed upon this principle as far as the first pair of valves, which seem to be placed not far from the orifice of the absorbing vessel, whether *lymphatic* or *lacteal*; and the fluid will then be propelled forwards, by a continuation of the absorption at the orifice. But this does not seem to be the only inducement to its progress towards the thoracic duct; these vessels have probably a muscular coat, which may serve to press the fluid forwards from one pair of valves to another; and as the large lymphatic vessels and the thoracic duct are placed close to the large arteries, which have a considerable pulsation, it is reasonable to suppose, that they derive some advantages from this situation.

SECT. XV. *Of the Generative Organs; of Conception*, &c.

§ 1. *The Male Organs.*

THE male organs of generation have been usually divided into the parts which serve to prepare the semen from the blood, and those which are destined to convey it into the womb. But it seems to be more proper to distinguish them into the *preparing*, the *containing*, and the *expelling* parts, which are the different offices of the *testes*, the *vesiculæ seminales*, and the *penis*; and this is the order in which we propose to describe them. 107.

The testes are two glandular bodies, serving to secrete the semen from the blood. They are originally formed and lodged within the cavity of the abdomen; and it is not till after the child is born, or very near that time, that they begin to pass into the groin, and from thence into the scrotum (M). By this disposition they

(L) In the dead body they may be easily demonstrated by opening the artery ramifying through any viscus, as in the spleen, for instance, and then throwing in air; by which the lymphatics will be distended. One of them may then be punctured, and mercury introduced into it through a blow-pipe.

(M) It sometimes happens in dissecting ruptures, that the intestine is found in the same sac, and in contact with the testis. This appearance was at first attributed to a supposed laceration of the peritoneum; but later observations, by pointing out the situation of the testicles in the fœtus, have led to prove, that the testis, as it descends into the scrotum, carries with it a portion or elongation of the peritoneum, which becomes its tunica vaginalis, or a kind of sac, in which the testicle is lodged, as will be explained in the course of this section. The communication between this sac and the cavity of the abdomen, is usually soon cut off; but in some subjects

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they are very wifely protected from the injuries to which they would be liable to be expofed, from the different pofitions of the child at the time of parturition.

The tefticles in this ftate are loofely attached to the pfoæ mufcles, by means of the peritoneum by which they are covered; and they are at this time of life connected in a very particular manner to the parietes of the abdomen, and likewife to the fcrotum, by means of a fubftance which Mr Hunter calls the *ligament* or *gubernaculum teftis*, becaufe it connects the teftis with the fcrotum, and directs its courfe in its defcent. This gubernaculum is of a pyramidal form, with its bulbous head fixed to the lower end of the teftis and epididymis, and lofes its lower and flender extremity in the cellular membrane of the fcrotum. It is difficult to afcertain what the ftructure and compofition of this gubernaculum is, but it is certainly vafcular and fibrous; and from certain circumftances, it would feem to be in part compofed of the cremafter mufcle, running upwards to join the lower end of the teftis.

We are not to fuppofe that the tefticle, when defcended into the fcrotum, is to be feen loofe as a piece of gut or omentum would be in a common hernial fac. We have already obferved, that during its refidence in the cavity of the abdomen it is attached to the peritoneum, which defcends with it; fo that when the fac is completed in the fcrotum, the tefticle is at firft attached only to the pofterior part of it, while the fore part of it lies loofe, and for fome time affords a communication with the abdomen. The fpermatic chord, which is made up of the fpermatic artery and vein, and of the vas deferens or excretory duct of the teftis, is clofely attached behind to the pofterior part of this elongation of the peritoneum. But the fore part of the peritoneal fac, which is at firft loofe and not attached to the tefticle, clofes after a certain time, and becomes united to the pofterior part, and thus perfectly furrounds the tefticle as it were in a purfe.

The tefticles of the fœtus differ only in their fize and fituation from thofe of the adult. In their paffage from the abdomen they defcend through the abdominal rings into the fcrotum, where they are fupported and defended by various integuments.

What the immediate caufe of this defcent is, has not yet been fatisfactorily determined. It has been afcribed to the effects of refpiration, but the tefticles have fometimes been found in the fcrotum before the child has breathed; and it does not feem to be occafioned by the action of the cremafter mufcle, becaufe the fame effect would be liable to happen in the hedgehog, and fome other quadrupeds, whofe tefticles remain in the abdomen during life.

The fcrotum, which is the external or common covering of both tefticles, is a kind of fac formed by the common integuments, and externally divided into two equal parts by a prominent line called *raphe*.

In the inner part of the fcrotum we meet with a cellular coat called *dartos* (N), which by its duplicature divides the fcrotum into two equal parts, and forms what is called *feptum fcroti*, which correfponds with the raphe. The collapfion which is fo often obferved to take place in the fcrotum of the healthy fubject, when excited by cold or by the ftimulus of venery, feems to be very properly attributed to the contractile motion of the fkin, and not to any mufcular fibres, as is the cafe in dogs and fome other quadrupeds.

The fcrotum, then, by means of its feptum, is found to make two diftinct bags, in which the tefticles, invefted by their proper tunics, are fecurely lodged and feparated from each other. Thefe coats are the cremafter, the tunica vaginalis, and the tunica albuginea. The firft of thefe is compofed of mufcular fibres, and is to be confidered only as a partial covering of the teftis; for it furrounds only the fpermatic chord, and terminates upon the upper and external parts of the tunica vaginalis teftis, ferving to draw up and fufpend the tefticle (O). The tunica vaginalis teftis has already been defcribed as being a thin production of the peritoneum, loofely adhering every where to the tefticle, which it includes as it were in a bag. The tunica albuginea is a firm, white, and very compact membrane of a gliftening appearance, which immediately invefts the body of the teftis and the epididymis; ferving in fome meafure to connect them to each other, but without extending itfelf at all to the fpermatic chord. This tunica albuginea ferves to confine the growth of the teftis and epididymis within certain limits, and by giving them a due degree of firmnefs, enables them to perform their proper functions.

Having removed this laft tunic, we difcover the fubftance of the tefticle itfelf, which appears to be made up of an infinite number of very elaftic filaments, which may be beft diftinguifhed after macerating the tefticle in water. Each tefticle is made up of the fpermatic artery and vein, and the excretory veffels or tubuli feminiferi. There are likewife a great number of abforbent veffels, and fome branches of nerves to be met with in the tefticles.

The fpermatic arteries arife one on each fide from the aorta, generally about an inch below the emulgents. The right fpermatic vein commonly paffes into the vena cava; but the left fpermatic vein ufually empties itfelf into the emulgent on that fide; and it is fuppofed

jects it continues open during life; and when an hernia or defcent of the inteftine takes place in fuch a fubject, it does not pufh down a portion of the peritonæum before it, as it muft otherwife neceffarily do, but paffes at once through this opening, and comes in contact with the naked tefticle, conftituting that particular fpecies of rupture called *hernia congenita*.

(N) The dartos has ufually been confidered as a mufcle, and is defcribed as fuch both by Douglas and Winflow. But there being no part of the fcrotum of the human fubject which can be faid to confift of mufcular fibres, Albinus and Haller have very properly omitted to defcribe the dartos as a mufcle, and confider it merely as a cellular coat.

(O) The cremafter mufcle is compofed of a few fibres from the obliquus internus abdominis, which uniting with a few from the tranfverfalis, defcend upon the fpermatic chord, and are infenfibly loft upon the tunica vaginalis of the tefticle. It ferves to fufpend and draw up the tefticle.

posed to take this course into the emulgent, that it may avoid passing over the aorta, which it would be obliged to do in its way to the vena cava.

The blood is circulated very slowly through the spermatic artery, which makes an infinite number of circumvolutions in the substance of the testicle, where it deposites the semen, which passes through the tubuli seminiferi. These tubuli seminiferi are seen running in short waves from the tunica albuginea to the axis of the testicle; and are divided into distinct portions by certain thin membranous productions, which originate from the tunica albuginea. They at length unite, and by an infinite number of convolutions form a sort of appendix to the testis called *epididymis* (P), which is a vascular body of an oblong shape, situate upon the superior part of each testicle. These tubuli of the epididymis at length form an excretory duct called *vas deferens*, which ascends towards the abdominal rings, with the other parts that make up the spermatic chord, and then a separtion takes place; the nerves and blood-vessels passing on to their several terminations, and the vas deferens going to deposite its semen in the vesiculæ seminales, which are two soft bodies of a white and convoluted appearance externally, situated obliquely between the rectum and the lower part of the bladder, and uniting together at the lower extremity. From these reservoirs (Q), which are plentifully supplied with blood-vessels and nerves, the semen is occasionally discharged through two short passages, which open into the urethra close to a little eminence called *verumontanum*.

Near this eminence we meet with the prostate, which is situated at the neck of the bladder, and is described as being of a glandular structure. It is shaped somewhat like a heart with its small end foremost, and invests the origin of the urethra. Internally it appears to be of a firm substance, and composed of several follicles, secreting a whitish viscid fluid, that is discharged by ten or twelve excretory ducts into the urethra, on each side of the openings of the vesiculæ seminales at the same time, and from the same causes that the semen is expelled. As this latter fluid is found to be exceedingly limpid in the vesiculæ seminales of the dead subject, it probably owes its whiteness and viscidity to this liquor of the prostate.

The penis, which is to be considered as the vehicle or active organ of procreation, is composed of two columns, the corpora cavernosa and corpus spongiosum. The corpora cavernosa, which constitute the greatest part of the penis, may be described as two cylindrical ligamentous tubes, each of which is composed of an infinite number of minute cells of a spongy texture, which communicate with each other. These two bodies are of a very pliant texture, and capable of considerable distension; and being united laterally to each other, occasion by this union a space above and another below. The uppermost of these spaces is filled by the blood-vessels, and the lower one, which is larger than the other, by the urethra and its corpus spongiosum. These two cavernous bodies are at first only separated by a partition of tendinous fibres, which allow them to communicate with each other; but they afterwards

(P) The testicles were named *didymi* by the ancients, and the name of this part was given to it on account of its situation upon the testicle.

(Q) That the bags called *vesiculæ seminales* are reservoirs of semen, is a circumstance which has been by anatomists universally believed. Mr J. Hunter, however, from several circumstances, has been induced to think this opinion erroneous.

He has examined these vesiculæ in people who have died suddenly, and he found their contents to be different in their properties from the semen. In those who had lost one of the testicles, or the use of one of them by disease, both the vesiculæ were full, and their contents similar. And in a *lusus naturæ*, where there was no communication between the vasa deferentia and vesiculæ, nor between the vesiculæ and penis, the same thing took place.

From these observations, he thinks we have a presumptive proof, That the semen can be absorbed in the body of the testicle and in the epididymis, and that the vesiculæ secrete a mucus which they are capable of absorbing when it cannot be made use of: That the semen is not retained in reservoirs after it is secreted, and kept there till it is used; but that it is secreted at the time, in consequence of certain affections of the mind stimulating the testicles to this action.

He corroborates his observations by the appearance on dissection in other animals; and here he finds, That the shape and contents of the vesiculæ vary much in different animals, while the semen in most of them he has examined is nearly the same: That the vasa deferentia in many animals do not communicate with the vesiculæ: That the contents of the vesiculæ of castrated and perfect animals are similar, and nearly equal in quantity, in no way resembling the semen as emitted from the animal *in coitu*, or what is found in the vas deferens after death. He observes likewise, that the bulb of the urethra of perfect males is considerably larger than in castrated animals.

From the whole, he thinks the following inferences may be fairly drawn: That the bags called *vesiculæ seminales* are not seminal reservoirs, but glands secreting a peculiar mucus; and that the bulb of the urethra is properly speaking the receptacle of the semen, in which it is accumulated previous to ejection.

But although he has endeavoured to prove that the vesiculæ do not contain the semen, he has not been able to ascertain their particular use. He thinks, however, we may be allowed upon the whole to conclude, that they are, together with other parts, subservient to the purposes of generation.

Although the author has treated this subject very ably, and made many ingenious observations, some things may be objected to what he has advanced; of which the following are a few: That those animals who have bags

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wards devaricate from each other like the branches of the letter Y, and diminiſhing gradually in ſize, are attached, one on each ſide, by means of the ligamentum ſuſpenſorium penis to the ramus iſchii, and to the inferior portion of the os pubis.

The corpus ſpongioſum penis, or corpus ſpongioſum urethræ, as it is ſtyled by ſome authors, begins as ſoon as the urethra has paſſed the proſtate, with a thick origin almoſt like a heart, firſt under the urethra, and afterwards above it, becoming gradually thinner, and ſurrounding the whole canal of the urethra, till it terminates in a conſiderable expanſion, and conſtitutes what is called the *glans penis*, which is exceedingly vaſcular, and covered with papillæ like the tongue. The cuticle which lines the inner ſurface of the urethra, is continued over the glans in the ſame manner as it is ſpread over the lips.

The penis is inveſted by the common integuments, but the cutis is reflected back every where from the glans as it is in the eye-lids; ſo that it covers this part, when the penis is in a relaxed ſtate, as it were with a hood, and from this uſe is called *prepuce*.

The prepuce is tied down to the under part of the glans by a ſmall ligament called *frœnum*, which is in fact only a continuation of the cuticle and cutis. There are many ſimple ſebaceous follicles called *glandulæ odoriferæ*, placed round the baſis of the glans; and the fluid they ſecrete ſerves to preſerve the exquiſite ſenſibility of this part of the penis, and to prevent the ill effects of attrition from the prepuce.

The urethra may be defined to be a membranous canal, paſſing from the bladder through the whole extent of the penis. Several very ſmall openings, called *lacunæ*, communicate with this canal, through which a mucus is diſcharged into it; and beſides theſe, there are two glands, firſt deſcribed by Cowper, as ſecreting a fluid for lubricating the urethra, and called *Cowper's glands* (R); and Littre * ſpeaks of a gland ſituated near the proſtate, as being deſtined for the ſame uſe.

* *Memoires de l' Acad. Royale des Sciences*, 1700.

The urethra being continued from the neck of the bladder, is to be conſidered as making part of the urinary paſſage; and it likewiſe affords a conveyence to the ſemen, which we have obſerved is occaſionally diſcharged into it from the veſiculæ ſeminales. The direction of this canal being firſt under and then before the pubis, occaſion a winding in its courſe from the bladder to the penis, not unlike the turns of the letter *S*.

The penis has three pair of muſcles, the erectores, acceleratores, and tranſverſales. They puſh the blood from the crura to the fore part of the corpora cavernoſa. The firſt originate from the tuberoſity of the iſchium, and terminate in the corpora cavernoſa. The acceleratores ariſe from the ſphincter, and by their inſertion ſerve to compreſs the bulbous part of the urethra; and the tranſverſales are deſtined to afford a paſſage to the ſemen, by dilating the canal of the urethra.

The arteries of the penis are chiefly derived from the internal iliacs. Some of them are ſuppoſed to terminate by pabulous orifices within the corpora cavernoſa and corpus ſpongioſum; and others terminate in veins, which at laſt make up the vena magna dorſi penis, and other ſmaller veins, which are in general diſtributed in like order with the arteries.

Its nerves are large and numerous. They ariſe from the great ſciatic nerve, and accompany the arteries in their courſe through the penis.

We have now deſcribed the anatomy of this organ; and there only remains to be explained, how it is enabled to attain that degree of firmneſs and diſtenſion which is eſſential to the great work of generation.

The greateſt part of the penis has been ſpoken of as being of a ſpongy and cellular texture, plentifully ſupplied with blood-veſſels and nerves, and as having muſcles to move it in different directions. Now, the blood is conſtantly paſſing into its cells through the ſmall branches of the arteries which open into them, and is from thence as conſtantly returned by the veins, ſo long as the corpora cavernoſa and corpus ſpongioſum continue to be in a relaxed and pliant ſtate. But when, from any nervous influence, or other means, which it is not neceſſary here to define or explain, the erectores penis, ejaculatores ſeminis, levatores ani, &c. are induced to contract, the veins undergo a certain degree of compreſſion, and the paſſage of the blood through them is ſo much impeded, that it collects in them in a greater proportion than they are enabled to carry off, ſo that the penis gradually enlarges; and being more and more forcibly drawn up againſt the os pubis, the vena magna itſelf is at length compreſſed, and the penis becomes fully diſtended. But as the cauſes which firſt occaſioned this diſtention ſubſide, the penis gradually returns to its ſtate of relaxation.

§ 2. *Female Organs of Generation.*

ANATOMICAL writers uſually divide the female organs of generation into *external* and *internal*. In the 108
firſt diviſion they include the *mons veneris*, *labia pudendi*, *perinæum*, *clitoris*, *nymphæ*, and *carunculæ myrtiformes*;

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bags called *veſiculæ ſeminales* perform copulation quickly; whereas others that want them, as in the dog kind, are tedious in copulation: That in the human body, at leaſt, there is a free communication between the vaſa deferentia and veſiculæ; and in animals where the author has obſerved no communication between the vaſa deferentia and veſiculæ, there may be a communication by veſſels not yet diſcovered, and which may be compared to the hepato-cyſtic ducts in fowls and fiſhes: That the fluid in the end of the vaſa deferentia and the veſiculæ ſeminales are ſimilar, according to the author's own obſervation: That the veſiculæ in ſome animals increaſe and decreaſe with the teſticle at particular ſeaſons: That in birds and certain fiſhes, there is a dilatation of the ends of the vaſa deferentia, which the author himſelf allows to be a reſervoir for the ſemen.

With reſpect to the circumſtance of the bulb of the urethra anſwering the purpoſe of a reſervoir, the author has mentioned no facts which tend to eſtabliſh this opinion. See *Obſervations on certain Parts of the Animal Oeconomy*.

(R) Both Heiſter and Morgagni obſerve, that they have ſometimes not been able to find theſe glands; ſo that they do not ſeem to exiſt in all ſubjects.

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mes; and in the latter, the *vagina*, with the *uterus* and its appendages.

The *mons veneris*, which is placed on the upper part of the fymphyfis pubis, is internally compofed of adipofe membranes, which makes it foft and prominent: it divides into two parts called *labia pudendi*, which defcending towards the rectum, from which they are divided by the perinæum, form what is called the *fourchette*. The perinæum is that flefhy fpace which extends about an inch and an half from the fourchette to the anus, and from thence about two inches to the coccyx.

The labia pudendi being feparated, we obferve a fulcus called *foffa magna;* in the upper part of which is placed the clitoris, a fmall round fpongy body, in fome meafure refembling the male penis, but impervious, compofed of two corpora cavernofa, arifing from the tuberofities of the offa ifchii; furnifhed with two pair of mufcles, the erectores clitoridis, and the fphincter or conftricter oftii vaginæ; and terminating in a glans, which is covered with its prepuce. From the lower part, on each fide of the foffa, pafs the nymphæ, two membranous and fpongy folds which feem deftined for ufeful purpofes in parturition, by tending to enlarge the volume of the vagina as the child's head paffes through it. Between thefe, about the middle of the foffa magna, we perceive the orifice of the vagina or os externum, clofed by folds and wrinkles; and about half an inch above this, and about an inch below the clitoris, appears the meatus urinarius or orifice of the urethra, much fhorter, though fomewhat larger, than in men, with a little prominence at its lower edge, which facilitates the introduction of the catheter.

The os externum is furrounded internally by feveral membranous folds called *carunculæ myrtiformes*, which are partly the remains of a thin membrane called *hymen*, that covers the vagina in children. In general the hymen is fufficiently open to admit the paffage of the menfes, if it exifts at the time of their appearance; fometimes, however, it has been found perfectly clofed.

The vagina, fituated between the urethra and the rectum, is a membranous cavity, furrounded efpecially at its external extremity with a fpongy and vafcular fubftance, which is covered by the fphincter oftii vaginæ. It terminates in the uterus, about half an inch above the os tincæ, and is wider and fhorter in women who have had children than in virgins.

All thefe parts are plentifully fupplied with blood-veffels and nerves. Around the nymphæ there are febaceous follicles, which pour out a fluid to lubricate the inner furface of the vagina; and the meatus urinarius, like the urethra in the male fubject, is conftantly moiftened by a mucus, which defends it againft the acrimony of the urine.

The *uterus* is a hollow vifcus, fituated in the hypogaftric region, between the rectum and bladder. It is deftined to receive the firft rudiments of the fœtus, and to affift in the developement of all its parts, till it arrives at a ftate of perfection, and is fitted to enter into the world, at the time appointed by the wife Author of nature.

The uterus, in its unimpregnated ftate, refembles a pear in fhape, fomewhat flattened, with its fundus or bottom part turned towards the abdomen, and its cervix or neck furrounded by the vagina. The entrance into its cavity forms a little protuberance, which has been compared to the mouth of a tench, and is therefore called *os tincæ*.

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The fubftance of the uterus, which is of a confiderable thicknefs, appears to be compofed of mufcular and fmall ligamentous fibres, fmall branches of nerves, fome lymphatics, and with arteries and veins innumerable. Its nerves are chiefly derived from the intercoftal, and its arteries and veins from the hypogaftric and fpermatic. The membrane which lines its cervix, is a continuation of the inner membrane of the vagina; but the outer furface of the body of the uterus is covered with the peritonæum, which is reflected over it, and defcends from thence to the inteftinum rectum. This duplicature of the peritonæum, by paffing off from the fides of the uterus to the fides of the pelvis, is there firmly connected, and forms what are called *ligamenta uteri lata;* which not only ferve to fupport the uterus, but to convey nerves and blood-veffels to it.

The *ligamenta uteri rotunda* arife from the fides of the fundus uteri, and paffing along within the fore-part of the ligamenta lata, defcend through the abdominal rings, and terminate in the fubftance of the mons veneris. The fubftance of thefe ligaments is vafcular, and although both they and the ligamenta lata admit the uterus in the virgin ftate, to move only about an inch up and down, yet in the courfe of pregnancy they admit of confiderable diftenfion, and after parturition return nearly to their original ftate with furprifing quicknefs.

On each fide of the inner furface of the uterus, in the angle near the fundus, a fmall orifice is to be difcovered, which is the beginning of one of the tubæ fallopianæ. Each of thefe tubes, which are two in number, paffing through the fubftance of the uterus, is extended along the broad ligaments, till it reaches the edge of the pelvis, from whence it reflects back; and turning over behind the ligaments, about an inch of its extremity is feen hanging loofe in the pelvis, near the ovarium. Thefe extremities, having a jagged appearance, are called *fimbriæ*, or *morfus diaboli*. Each tuba Fallopiana is ufually about three or four inches long. Their cavities are at firft very fmall, but becomes gradually larger, like a trumpet, as they approach the fimbriæ.

Near the fimbriæ of each tuba Fallopiana, about an inch from the uterus, is fituated an oval body called *ovarium*, of about half the fize of the male tefticle. Each of thefe ovaria is covered by a production of the peritonæum, and hangs loofe in the pelvis. They are of a flat and angular form, and appear to be compofed of a white and cellular fubftance, in which we are able to difcover feveral minute veficles filled with a coagulable lymph, of an uncertain number, commonly exceeding 12 in each ovary. In the female of riper years, thefe veficles become exceedingly turgid, and a kind of yellow coagulum is gradually formed within one of them, which increafes for a certain time. In conception, one of thefe mature ova is fuppofed to be impregnated with the male femen, and to be fqueezed out of its nidus into the Fallopian tube; after which the ruptured part forms a fubftance which in fome animals is of a yellow colour, and is therefore called *corpus luteum;* and it is obfervable, that the number of thefe fcars or

Of the Abdomen.

fissures in the ovarium, constantly corresponds with the number of fœtuses excluded by the mother.

§ 3. *Of Conception.*

109 Man, being ever curious and inquisitive, has naturally been led to inquire after the origin of his existence; and the subject of generation has employed the philosophical world in all ages: but in following nature up to her minute recesses, the philosopher soon finds himself bewildered, and his imagination often supplies that which he so eagerly wishes to discover, but which is destined perhaps never to be revealed to him. Of the many theories which have been formed on this subject, that of the ancient philosophers seems to have been the most simple: they considered the male semen as alone capable of forming the fœtus, and believed that the female only afforded it a lodging in the womb, and supplied it with nourishment after it was perfectly formed. This opinion, however, soon gave place to another, in which the female was allowed a more considerable share in conception.

This second system considered the fœtus as being formed by the mixture of the seminal liquor of both sexes, by a certain arrangement of its several particles in the uterus. But in the 16th century, vesicles or eggs were discovered in the ovaria or female testicles; the fœtus had been found sometimes in the abdomen, and sometimes in the Fallopian tubes; and the two former opinions were exploded in favour of a new doctrine. The ovaria were compared to a bunch of grapes, being supposed to consist of vesicles, each of which had a stalk; so that it might be disengaged without hurting the rest, or spilling the liquor it contained. Each vesicle was said to include a little animal, almost complete in all its parts; and the vapour of the male semen being conveyed to the ovarium, was supposed to produce a fermentation in the vesicle, which approached the nearest to maturity; and thus inducing it to disengage itself from the ovarium, it passed into the tuba Fallopiana, thro' which it was conveyed to the uterus. Here it was supposed to take root like a vegetable seed, and to form, with the vessels originating from the uterus, what is called the *placenta;* by means of which the circulation is carried on between the mother and the fœtus.

This opinion, with all its absurdities, continued to be almost universally adopted till the close of the same century, when Leeuwenhoeck, by means of his glasses, discovered certain opake particles, which he described as so many animalcula, floating in the seminal fluid of the male.

This discovery introduced a new schism among the philosophers of that time, and gave rise to a system which is not yet entirely exploded. According to this theory, the male semen passing into the tubæ Fallopianæ, one of the animalcula penetrates into the substance of the ovarium, and enters into one of its vesicles or ova. This impregnated ovum is then squeezed from its husk, through the coats of the ovarium, and being seized by the fimbriæ, is conducted through the tube to the uterus, where it is nourished till it arrives at a state of perfection. In this system there is much ingenuity; but there are certain circumstances supposed to take place, which have been hitherto inexplicable. A celebrated modern writer, M. Buffon, endeavours to restore, in some measure, the most ancient opinion, by allowing the female semen a share in this office; asserting, that animalcula or organic particles are to be discovered in the seminal liquor of both sexes: he derives the female semen from the ovaria, and he contends that no ovum exists in those parts. But in this idea he is evidently mistaken; and the opinion now most generally adopted is, that an impregnation of the ovum, by the influence of the male semen, is essential to conception. That the ovum is to be impregnated, there can be no doubt; but as the manner in which such an impregnation is supposed to take place, and the means by which the ovum afterwards gets into the Fallopian tube, and from thence into the uterus, are still founded chiefly on hypothesis, we will not attempt to extend farther the investigation of a subject concerning which so little can be advanced with certainty.

§ 4. *Of the Fœtus in Utero.*

Opportunities of dissecting the human gravid uterus occurring but seldom, the state of the embryo (s) immediately after conception cannot be perfectly known. 110

When the ovum descends into the uterus, it is supposed to be very minute; and it is not till a considerable time after conception that the rudiments of the embryo begin to be ascertained.

About the third or fourth week the eye may discover the first lineaments of the fœtus; but these lineaments are as yet very imperfect, it being only about the size of a house-fly. Two little vesicles appear in an almost transparent jelly; the largest of which is destined to become the head of the fœtus, and the other smaller one is reserved for the trunk. But at this period no extremities are to be seen; the umbilical cord appears only as a very minute thread, and the placenta does not as yet absorb the red particles of the blood. At six weeks, not only the head but the features of the face begin to be developed. The nose appears like a small prominent line, and we are able to discover another line under it, which is destined for the separation of the lips. Two black points appear in the place of eyes, and two minute holes mark the ears. At the sides of the trunk, both above and below, we see four minute protuberances, which are the rudiments of the arms and legs. At the end of eight weeks the body of the fœtus is upwards of an inch in length, and both the hands and feet are to be distinguished. The upper extremities are found to increase faster than the lower ones, and the separation of the fingers is accomplished sooner than that of the toes.

At this period the human form may be decisively ascertained;—all the parts of the face may be distinguished, the shape of the body is clearly marked out, the haunches and the abdomen are elevated, the fingers and toes are separated from each other, and the intestines appear like minute threads.

At

(s) The rudiments of the child are usually distinguished by this name till the human figure can be distinctly ascertained, and then it has the appellation of *fœtus*.

At the end of the third month, the fœtus meaſures about three inches; at the end of the fourth month, five inches; in the fifth month, ſix or ſeven inches; in the ſixth month, eight or nine inches; in the ſeventh month, eleven or twelve inches; in the eighth month, fourteen or fifteen inches; and at the end of the ninth month, or full time, from eighteen to twenty-two inches. But as we have not an opportunity of examining the ſame fœtus at different periods of pregnancy, and as their ſize and length may be influenced by the conſtitution and mode of life of the mother, calculations of this kind muſt be very uncertain.

The fœtus during all this time aſſumes an oval figure, which correſponds with the ſhape of the uterus. Its chin is found reclining on its breaſt with its knees drawn up towards its chin, and its arms folded over them. But it ſeems likely, that the poſture of ſome of theſe parts is varied in the latter months of pregnancy, ſo as to cauſe thoſe painful twitches which its mother uſually feels from time to time. In natural caſes, its head is probably placed towards the os tincæ from the time of conception to that of its birth; tho' formerly it was conſidered as being placed towards the fundus uteri till about the eighth or ninth month, when the head, by becoming ſpecifically heavier than the other parts of the body, was ſuppoſed to be turned downwards.

The capacity of the uterus increaſes in proportion to the growth of the fœtus, but without becoming thinner in its ſubſtance, as might naturally be expected. The nouriſhment of the fœtus, during all this time, ſeems to be derived from the placenta, which appears to be originally formed by that part of the ovum which is next the fundus uteri. The remaining part of the ovum is covered by a membrane called *ſpongy chorion* (T); within which is another called *true chorion*, which includes a third termed *amnios* (U): this contains a watery fluid, which is the *liquor amnii* (V), in which the fœtus floats till the time of its birth. On the ſide next the fœtus, the placenta is covered by the amnios and true chorion; on the ſide next the mother it has a production continued from the ſpongy chorion. The amnios and chorion are remarkably thin and tranſparent, having no blood-veſſels entering into their compoſition. The ſpongy chorion is opake and vaſcular.

In the firſt months of pregnancy, the involucra bear a large proportion to their contents; but this proportion is afterwards reverſed, as the fœtus increaſes in bulk.

The placenta, which is the medium through which the blood is conveyed from the mother to the fœtus, and the manner in which this conveyance takes place, deſerve next to be conſidered.

The placenta is a broad, flat, and ſpongy ſubſtance, like a cake, cloſely adhering to the inner ſurface of the womb, uſually near the fundus, and appearing to be chiefly made up of the ramifications of the umbilical arteries and vein, and partly of the extremities of the uterine veſſels. The arteries of the uterus diſcharge their contents into the ſubſtance of this cake; and the veins of the placenta, receiving the blood either by a direct communication of veſſels, or by abſorption, at length form the umbilical vein, which paſſes on to the ſinus of the vena porta, and from thence to the vena cava, by means of the canalis venoſus, a communication that is cloſed in the adult. But the circulation of the blood through the heart is not conducted in the fœtus as in the adult: in the latter, the blood is carried from the right auricle of the heart through the pulmonary artery, and is returned to the left auricle by the pulmonary vein; but a dilatation of the lungs is eſſential to the paſſage of the blood through the pulmonary veſſels, and this dilatation cannot take place till after the child is born and has reſpired. This deficiency, however, is ſupplied in the fœtus by an immediate communication between the right and left auricle, through an oval opening, in the ſeptum which divides the two auricles, called *foramen ovale*. The blood is likewiſe tranſmitted from the pulmonary artery to the aorta, by means of a duct called *canalis arterioſus*, which, like the canalis venoſus, and foramen ovalæ, gradually cloſes after birth.

The blood is returned again from the fœtus through two arteries called the *umbilical arteries*, which ariſe from the iliacs. Theſe two veſſels taking a winding courſe with the vein, form with that, and the membranes by which they are ſurrounded, what is called the *umbilical chord*. Theſe arteries, after ramifying through the ſubſtance of the placenta, diſcharge their blood into the veins of the uterus; in the ſame manner as the uterine arteries diſcharged their blood into the branches

(T) Dr Hunter has deſcribed this as a lamella from the inner ſurface of the uterus. In the latter months of pregnancy it becomes gradually thinner and more connected with the chorion: he has named it *membrana caduca*, or *decidua*, as it is caſt off with the placenta. Signior Scarpa, with more probability, conſiders it as being compoſed of an inſpiſſated coagulable lymph.

(U) In ſome quadrupeds, the urine appears to be conveyed from the bladder through a canal called *urachus*, to the *allantois*, which is a reſervoir, reſembling a long and blind gut, ſituated between the chorion and amnios. The human fœtus ſeems to have no ſuch reſervoir, though ſome writers have ſuppoſed that it does exiſt. From the top of the bladder a few longitudinal fibres are extended to the umbilical chord; and theſe fibres have been conſidered as the urachus, though without having been ever found pervious.

(V) The liquor amnii coagulates like the lymph. It has been ſuppoſed to paſs into the œſophagus, and to afford nouriſhment to the fœtus; but this does not ſeem probable. Children have come into the world without an œſophagus, or any communication between the ſtomach and the mouth; but there has been no well atteſted inſtance of a child's having been born without a placenta; and it does not ſeem likely, that any of the fluid can be abſorbed through the pores of the ſkin, the ſkin in the fœtus being every where covered with a great quantity of mucus.

branches of the umbilical vein. So that the blood is constantly paffing in at one fide of the placenta and out at the other; but in what particular manner it gets through the placenta is a point not yet determined.

EXPLANATION OF PLATES XXV. XXVIII. and XXVI.

PLATE XXV.

FIG. 1. Shows the Contents of the Thorax and Abdomen in fitu.

1. Top of the trachea, or wind-pipe. 2 2, The internal jugular veins. 3 3, The fubclavian veins. 4 The vena cava defcendens. 5, The right auricle of the heart. 6, The right ventricle. 7, Part of the left ventricle. 8, The aorta defcendens. 9, The pulmonary artery. 10, The right lung, part of which is cut off to fhow the great blood-veffels. 11, The left lung entire. 12 12, The anterior edge of the diaphragm. 13 13, The two great lobes of the liver. 14, The ligamentum rotundum. 15, The gall-bladder. 16, The ftomach. 17 17, The jejunum and ilium. 18, The fpleen.

FIG. 2. Shows the Organs fubfervient to the Chylopoietic Vifcera,—with thofe of Urine and Generation.

1 1, The under fide of the two great lobes of the liver. a, Lobulus Spigelii. 2, The ligamentum rotundum. 3, The gall-bladder. 4. The pancreas. 5, The fpleen. 6 6, The kidneys. 7, The aorta defcendens. 8, Vena cava afcendens. 9 9, The renal veins covering the arteries. 10, A probe under the fpermatic veffels and a bit of the inferior mefenteric artery, and over the ureters. 11 11, The ureters. 12 12, The iliac arteries and veins. 13, The rectum inteftinum. 14, The bladder of urine.

FIG. 3. Shows the Chylopoietic Vifcera, and Organs fubfervient to them, taken out of the Body entire.

A A, The under fide of the two great lobes of the liver. B, Ligamentum rotundum. C, The gall-bladder. D, Ductus cyfticus. E, Ductus hepaticus. F, Ductus communis choledochus. G, Vena portarum. H, Arteria hepatica. I I, The ftomach. K K, Venæ & arteriæ gaftro-epiploicæ, dextræ & finiftræ. L L, Venæ & arteriæ coronariæ ventriculi. M, The fpleen. N N, Mefocolon, with its veffels. O O O, Inteftinum colon. P, One of the ligaments of the colon, which is a bundle of longitudinal mufcular fibres. Q Q Q Q, Jejunum and ilium. R R, Sigmoid flexure of the colon with the ligament continued, and over S, The rectum inteftinum. T T, Levators ani. U, Sphincter ani. V, The place to which the proftate gland is connected. W, The anus.

FIG. 4. Shows the Heart of a Fœtus at the full time, with the Right Auricle cut open to fhow the Foramen Ovale, or paffage between both Auricles.

a, The right ventricle. b, The left ventricle. c c, The outer fide of the right auricle ftretched out. d d, The pofterior fide, which forms the anterior fide of the feptum. e, The foramen ovale, with the membrane or valve which covers the left fide. f, Vena cava inferior paffing through g, A portion of the diaphragm.

FIG. 5. Shows the Heart and Large Veffels of a Fœtus at the full time.

a, The left ventricle. b, The right ventricle. c, A part of the right auricle. d, Left auricle. e e, The right branch of the pulmonary artery. f, Arteria pulmonalis. g g, The left branch of the pulmonary artery, with a number of its largeft branches diffected from the lungs. h, The canalis arteriofus. i, The arch of the aorta. k k, The aorta defcendens. l, The left fubclavian artery. m, The left carotid artery. n, The right carotid artery. o, The right fubclavian artery. p, The origin of the right carotid and right fubclavian arteries in one common trunk. q, The vena cava fuperior or defcendens. r, The right common fubclavian vein. s, The left common fubclavian vein.

N. B. All the parts defcribed in this figure are to be found in the adult, except the canalis arteriofus.

PLATE XXVIII.

FIG. 1. Exhibits the more fuperficial Lymphatic Veffels of the Lower Extremity.

A, The fpine of the os ilium. B, The os pubis. C, The iliac artery. D, The knee. E, E, F, Branches of the crural artery. G, The mufculus gaftrocnemius. H, The tibia. I, The tendon of the mufculus tibialis anticus. On the out-lines, a, A lymphatic veffel belonging to the top of the foot. b, Its firft divifion into branches. c, c, c, Other divifions of the fame lymphatic veffel. d, A fmall lymphatic gland. e, The lymphatic veffels which lie between the fkin and the mufcles of the thigh. f, f, Two lymphatic glands at the upper part of the thigh below the groin. g, g, Other glands. h, A lymphatic veffel which paffes by the fide of thofe glands without comunicating with them; and, bending towards the infide of the groin at (i), opens into the lymphatic gland (k). l, l, Lymphatic glands in the groin, which are common to the lymphatic veffels of the genitals and thofe of the lower extremity. m, n, A plexus of lymphatic veffels paffing on the infide of the iliac artery.

FIG. 2. Exhibits a Back View of the Lower Extremity, diffected fo as to fhow the deeper-feated Lymphatic Veffels which accompany the Arteries.

A, The os pubis. B, The tuberofity of the ifchium. C, That part of the os ilium which was articulated with the os facrum. D, The extremity of the iliac artery appearing above the groin. E, The knee. F, F, The two cut furfaces of the triceps mufcle, which was divided to fhow the lymphatic veffels that pafs through its perforation along with the crural artery. G, The edge of the mufculus gracilis. H, The gaftrocnemius and foleus, much fhrunk by being dried, and by the foleus being feparated from the

the tibia to expoſe the veſſels. I, The heel. K, The ſole of the foot. L, The ſuperficial lymphatic veſſels paſſing over the knee, to get to the thigh. On the out-lines; M, The poſterior tibial artery. a, A lymphatic veſſel accompanying the poſterior tibial artery. b, The ſame veſſel croſſing the artery. c, A ſmall lymphatic gland, thro' which this deep-ſeated lymphatic veſſel paſſes. d, The lymphatic veſſel paſſing under a ſmall part of the ſoleus, which is left attached to the bone, the reſt being removed. e, The lymphatic veſſel croſſing the popliteal artery. f, g, h, Lymphatic glands in the ham, through which the lymphatic veſſel paſſes. i, The lymphatic veſſel paſſing with the crural artery, through the perforation of the triceps muſcle. k, The lymphatic veſſel, after it has paſſed the perforation of the triceps, dividing into branches which embrace the artery (l). m, A lymphatic gland belonging to the deep-ſeated lymphatic veſſel. At this place thoſe veſſels paſs to the fore part of the groin, where they communicate with the ſuperficial lymphatic veſſels. n, A part of the ſuperficial lymphatic veſſel appearing on the brim of the pelvis.

Fig. 3. Exhibits the Trunk of the Human Subject, prepared to ſhow the Lymphatic Veſſels and the Ductus Thoracicus.

A, The neck. B B, The two jugular veins. C, The vena cava ſuperior. D D D D, The ſubclavian veins. E, The beginning of the aorta, pulled to the left ſide by means of a ligature, in order to ſhow the thoracic duct behind it. F, The branches ariſing from the curvature of the aorta. G G, The two carotid arteries. H H, The firſt ribs, I I, The trachea. K K, The ſpine. L L, the vena azygos. M M, The deſcending aorta. N, The cœliac artery, dividing into three branches. O, The ſuperior meſenteric artery. P, The right crus diaphragmatis. Q Q, The two kidneys. R, The right emulgent artery. S S, The external iliac arteries. g d, The muſculi pſoæ. T, The internal iliac artery. U, The cavity of the pelvis. X X, The ſpine of the os ilium. Y Y, The groins. *a*, A lymphatic gland in the groin, into which lymphatic veſſels from the lower extremity are ſeen to enter. *b b*, The lymphatic veſſels of the lower extremities paſſing under Poupart's ligament. *c c*, A plexus of the lymphatic veſſels lying on each ſide of the pelvis. *d*, The pſoas muſcle with lymphatic veſſels lying upon its inſide. *e*, A plexus of lymphatics, which having paſſed over the brim of the pelvis at (*c*), having entered the cavity of the pelvis, and received the lymphatic veſſels belonging to the viſcera contained in that cavity, next aſcends, and paſſes behind the iliac artery to (*g*). *f*, Some lymphatic veſſels of the left ſide paſſing over the upper part of the os ſacrum, to meet thoſe of the right ſide. *g*, The right pſoas, with a large plexus of lymphatics lying on its inſide. *h h*, The plexus lying on each ſide of the ſpine. *i i i*, Spaces occupied by the lymphatic glands. *k*, The trunk of the lacteals, lying on the under ſide of the ſuperior meſenteric artery. *l*, The ſame dividing into two branches, one of which paſſes on each ſide of the aorta; that of the right ſide being ſeen to enter the thoracic duct at (*m*). *m*, The thoracic duct beginning from the large lymphatics. *n*, The duct paſſing under the lower part of the crus diaphragmatis, and under the right emulgent artery. *o*, The thoracic duct penetrating the thorax. *p*, Some lymphatic veſſels joining that duct in the thorax. *q*, The thoracic duct paſſing under the curvature of the aorta to get to the left ſubclavian vein. The aorta being drawn aſide to ſhow the duct. *r*, A plexus of lymphatic veſſels paſſing upon the trachea from the thyroide gland to the thoracic duct.

Plate XXVI.

Fig. 1. Repreſents the Under and Poſterior Side of the Bladder of Urine. &c.

a, The bladder. b b, The inſertion of the ureters. c c, The vaſa deferentia, which convey the ſemen from the teſticles to d d, The veſiculæ ſeminales,—and paſs through e, The proſtate gland, to diſcharge themſelves into f, The beginning of the urethra.

Fig. 2 A tranſverſe Section of the Penis.

g g, Corpora cavernoſa penis. h, Corpus cavernoſum urethræ. i, Urethra. k, Septum penis. l l, The ſeptum between the corpus cavernoſum urethræ and that of the penis.

Fig. 3. A Longitudinal Section of the Penis.

m m, The corpora cavernoſa penis, divided by o, The ſeptum penis. n, The corpus cavernoſum glandis, which is the continuation of that of the urethra.

Fig. 4. Repreſents the Female Organs of Generation.

a, That ſide of the uterus which is next the os ſacrum. 1, Its fundus. 2, Its cervix. b b, The Fallopian or uterine tubes, which open into the cavity of the uterus;—but the other end is open within the pelvis, and ſurrounded by c c, The fimbriæ. d d, The ovaria. e, The os internum uteri, or mouth of the womb. f f, The ligamenta rotunda, which paſſes without the belly, and is fixed to the labia pudendi. g g, The cut edges of the ligamenta lata, which connects the uterus to the pelvis. h, The inſide of the vagina. i, The orifice of the urethra. k, The clitoris ſurrounded by (l,) The præputium. m m, The labia pudendi. n n, The nymphæ.

Fig. 5. Shows the Spermatic Ducts of the Teſticle filled with Mercury.

A, The vas deferens. B, Its beginning, which forms the poſterior part of the epididymis. C, The middle of the epididymis, compoſed of ſerpentine ducts. D, The head or anterior part of the epididymis unravelled. e e e e, The whole ducts which compoſe the head of the epididymis unravelled. f f, The vaſa deferentia. g g, Rete teſtis. h h, Some rectilineal ducts which ſend off the vaſa deferentia. i i, The ſubſtance of the teſticle.

Fig. 6. The Right Teſticle entire, and the Epididymis filled with Mercury.

A, The beginning of the vas deferens. B, The vas deferens aſcending towards the abdomen. C, The poſterior part of the epididymis, named *globus minor*. D, The ſpermatic veſſels incloſed in cellular ſubſtance. E, The body of the epididymis. F, Its head, named *globus major*. G, Its beginning from the teſticle. H, The body of the teſticle, incloſed in the tunica albuginea.

PART

Fig. 1.

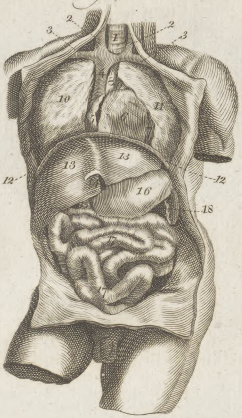


Fig. 2.

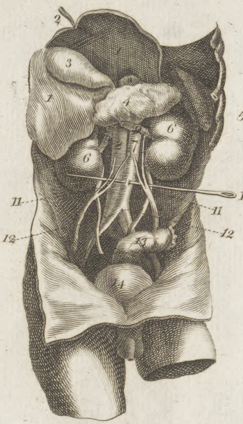
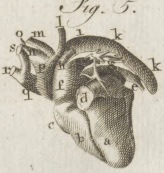


Fig. 3.

Fig. 4.

Fig. 5.



A Bell Sculp.t

Fig. 1.

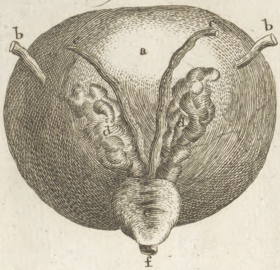


Fig. 4.

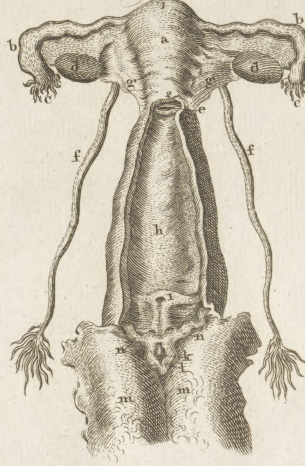


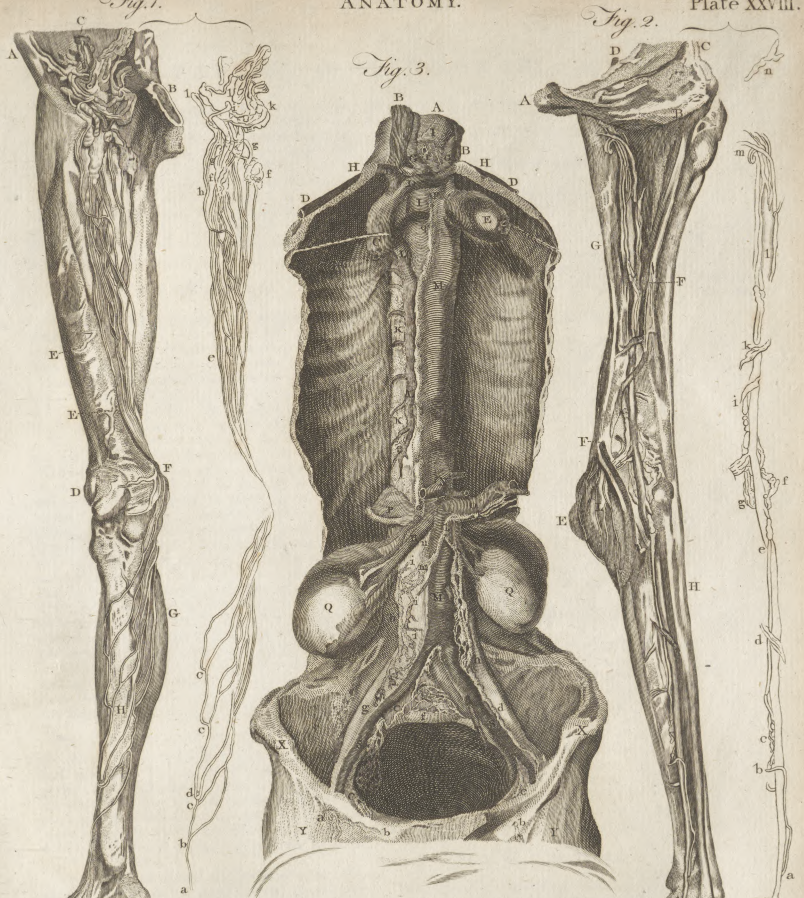
Fig. 2.

Fig. 5.

Fig. 6.

Fig. 3.

A. Bell Sculp[t].



A. Bell Prin Wal. Sculptor fecit.

PART IV. Of the THORAX.

111 Of the chest. THE THORAX, or CHEST, is that cavity of the trunk which extends from the clavicles, or the lower part of the neck, to the diaphragm, and includes the vital organs, which are the heart and lungs; and likewife the trachea and œfophagus.—This cavity is formed by the ribs and vertebræ of the back, covered by a great number of mufcles, and by the common integuments, and anteriorly by two glandular bodies called the *breafts*. The fpaces between the ribs are filled up by mufcular fibres, which from their fituation are called *intercoftal mufcles*.

Sect. I. *Of the Breafts.*

112. The *breafts* may be defined to be two large conglomerate glands, mixed with a good deal of adipofe membrane. The glandular part is compofed of an infinite number of minute arteries, veins, and nerves.

The arteries are derived from two different trunks; one of which is called the *internal*, and the other the *external*, *mammary artery*. The firft of thefe arifes from the fubclavian, and the latter from the axillary.

The veins every where accompany the arteries, and are diftinguifhed by the fame name. The nerves are chiefly from the vertebral pairs. Like all other conglomerate glands, the breafts are made up of a great many fmall diftinct glands, in which the milk is fecreted from the ultimate branches of arteries. The excretory ducts of thefe feveral glands, gradually uniting as they approach the nipple, form the tubuli lactiferi, which are ufually more than a dozen in number, and open at its apex, but have little or no communication, as has been fuppofed, at the root of the nipple. Thefe ducts, in their courfe from the glands, are furrounded by a ligamentary elaftic fubftance, which terminates with them in the nipple. Both this fubftance, and the ducts which it contains, are capable of confiderable extenfion and contraction; but in their natural ftate are moderately corrugated, fo as to prevent an involuntary flow of milk, unlefs the diftending force be very great from the accumulation of too great a quantity.

The whole fubftance of the nipple is very fpongy and elaftic: its external furface is uneven, and full of fmall tubercles. The nipple is furrounded with a difk or circle of a different colour, called the *areola*; and on the infide of the fkin, under the areola, are many febaceous glands, which pour out a mucus to defend the areola and nipple: for the fkin upon thefe parts is very thin; and the nervous papillæ lying very bare, are much expofed to irritation.

The breafts are formed for the fecretion of milk, which is deftined for the nourifhment of the child for fome time after its birth. This fecretion begins to take place foon after delivery, and continues to flow for many months in very large quantities, if the woman fuckles her child.

The operation of fuction depends on the principles of the air-pump, and the flow of milk through the lactiferous tubes is facilitated by their being ftretched out.

The milk, examined chemically, appears to be compofed of oil, mucilage, and water, and of a confiderable quantity of fugar. The generality of phyfiologifts have fuppofed that, like the chyle, it frequently retains the properties of the aliment and medicines taken into the ftomach; but from fome late experiments *, this fuppofition appears to be ill founded. * *Journ. de Med.* 1781.

Sect. II. *Of the Pleura.*

The cavity of the thorax is every where lined by a membrane of a firm texture called *pleura*. It is compofed of two diftinct portions or bags, which, by being applied to each other laterally, form a feptum called *mediaftinum*; which divides the cavity into two parts, and is attached pofteriorly to the vertebræ of the back, and anteriorly to the fternum. But the two laminæ of which this feptum is formed, do not every where adhere to each other; for at the lower part of the thorax they are feparated, to afford a lodgment to the heart; and at the upper part of the cavity, they receive between them the thymus. 113.

The pleura is plentifully fupplied with arteries and veins from the internal mammary and the intercoftals. Its nerves, which are very inconfiderable, are derived chiefly from the dorfal and intercoftal nerves.

The furface of the pleura, like that of the peritonæum and other membranes lining cavities, is conftantly bedewed with a ferous moifture (w), which prevents adhefions of the vifcera.

The mediaftinum, by dividing the breaft into two cavities, obviates many inconveniences, to which we fhould otherwife be liable. It prevents the two lobes of the lungs from compreffing each other when we lie on one fide; and confequently contributes to the freedom of refpiration, which is difturbed by the leaft preffure on the lungs. If the point of a fword penetrates between the ribs into the cavity of the thorax, the lungs on that fide ceafe to perform their office; becaufe the air being admitted through the wound, prevents the dilatation of that lobe; while the other lobe, which is feparated from it by the mediaftinum, remains unhurt, and continues to perform its function as ufual.

Sect. II. *Of the Thymus.*

The *thymus* is a glandular fubftance, the ufe of which is not perfectly afcertained, its excretory duct not having yet been difcovered. It is of an oblong figure, 114.

(w) When this fluid is exhaled in too great a quantity, or is not properly carried off, it accumulates and conftitutes the hydrops pectoris.

figure, and is larger in the fœtus and in young children than in adults, being ſometimes nearly effaced in very old ſubjects. It is placed in the upper part of the thorax, between the two laminæ of the mediaſtinum; but at firſt is not altogether contained within the cavity of the cheſt, being found to border upon the upper extremity of the ſternum.

Sect. IV. *Of the Diaphragm.*

115. The cavity of the thorax is ſeparated from that of the abdomen, by a fleſhy and membranous ſeptum called the *diaphragm* or *midriff*. The greateſt part of it is compoſed of muſcular fibres; and on this account ſyſtematic writers uſually place it very properly among the muſcles. Its middle part is tendinous, and it is covered by the pleura above, and by the peritonæum below. It ſeems to have been improperly named *ſeptum tranſverſum*, as it does not make a plane tranſverſe diviſion of the two cavities, but forms a kind of vault, the fore part of which is attached to the ſternum. Laterally it is fixed to the laſt of the true ribs, and to all the falſe ribs; and its lower and poſterior part is attached to the vertebræ lumborum, where it may be ſaid to be divided into two portions or crura (x.)

The principal arteries of the diaphragm are derived from the aorta, and its veins paſs into the vena cava. Its nerves are chiefly derived from the cervical pairs. It affords a paſſage to the vena cava through its tendinous part, and to the œſophagus through its fleſhy portion. The aorta paſſes down behind it between its crura.

The diaphragm not only ſerves to divide the thorax from the abdomen, but by its muſcular ſtructure is rendered one of the chief agents in reſpiration. When its fibres contract, its convex ſide, which is turned towards the thorax, becomes gradually flat, and by increaſing the cavity of the breaſt, affords room for a complete dilatation of the lungs, by means of the air which is then drawn into them by the act of inſpiration. The fibres of the diaphragm then relax; and as it reſumes its former ſtate, the cavity of the thorax becomes gradually diminiſhed, and the air is driven out again from the lungs by a motion contrary to the former one, called *exſpiration.*

It is in ſome meaſure, by means of the diaphragm, that we void the feces at the anus, and empty the urinary bladder. Beſides theſe offices, the acts of coughing, ſneezing, ſpeaking, laughing, gaping, and ſighing, could not take place without its aſſiſtance; and the gentle preſſure which all the abdominal viſcera receive from its conſtant and regular motion, cannot fail to aſſiſt in the performance of the ſeveral functions which were aſcribed to thoſe viſcera.

Sect. V. *Of the Trachea.*

The trachea, or windpipe, is a cartilaginous and membranous canal, through which the air paſſes into the lungs. Its upper part, which is called the *larynx*, is compoſed of five cartilages. The uppermoſt of theſe cartilages is placed over the glottis or mouth of the larynx, and is called *epiglottis*, which has been before ſpoken of, as cloſing the paſſage to the lungs in the act of ſwallowing. At the ſides of the glottis are placed the two arytenoide cartilages, which are of a very complex figure, not eaſy to be deſcribed. The anterior and larger part of the larynx is made up of two cartilages; one of which is called *thyroides* or *ſcutiformis*, from its being ſhaped like a buckler; and the other *cricoides* or *annularis*, from its reſembling a ring. Both theſe cartilages may be felt immediately under the ſkin; at the fore part of the throat, and the thyroides, by its convexity, forms an eminence called *pomum adami*, which is uſually more conſiderable in the male than in the female ſubject. 116.

All theſe cartilages are united to each other by means of very elaſtic, ligamentous fibres; and are enabled, by the aſſiſtance of their ſeveral muſcles, to dilate or contract the paſſage of the larynx, and to perform that variety of motion which ſeems to point out the larynx as the principal organ of the voice; for when the air paſſes out through a wound in the trachea, it produces no ſound.

Theſe cartilages are moiſtened by a mucus, which ſeems to be ſecreted by minute glands ſituated near them. The upper part of the trachea is covered anteriorly and laterally by a conſiderable body, which is ſuppoſed to be of a glandular ſtructure, and from its ſituation near the thyroid cartilage is called the *thyroid gland;* though its excretory duct has not yet been diſcovered, or its real uſe aſcertained.

The glottis is interiorly covered by a very fine membrane, which is moiſtened by a conſtant ſupply of a watery fluid. From the larynx, the canal begins to take the name of *trachea* or *aſpera arteria*, and extends from thence as far down as the third or fourth vertebra of the back, where it divides into two branches, which are the right and left bronchial tube. Each of theſe bronchi (y) ramifies through the ſubſtance of that lobe of the lungs, to which it is diſtributed, by an infinite number of branches, which are formed of cartilages ſeparated from each other like thoſe of the trachea, by an intervening membranous and ligamentary ſubſtance. Each of theſe cartilages is of an angular figure; and as they become gradually leſs and leſs in their diameter, the lower ones are in ſome meaſure received into thoſe above them, when the lungs, after being inflated, gradually collapſe by the air being puſhed,

(x) Anatomical writers have uſually deſcribed the diaphragm as being made up of two muſcles united by a middle tendon; and theſe two portions or crura form what they ſpeak of as the *inferior muſcle*, ariſing from the ſides and fore part of the vertebræ.

(y) The right bronchial tube is uſually found to be ſomewhat ſhorter and thicker than the left; and M. Portal, who has publiſhed a memoir on the action of the lungs on the aorta in reſpiration, obſerves, that the left bronchial tube is cloſely contracted by the aorta; and from ſome experiments he is induced to conclude, that in the firſt reſpirations, the air only enters into the right lobe of the lungs. *Memoires de l'Academie Royale des Sciences*, 1769.

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ed out from them in exſpiration. As the branches of the bronchi become more minute, their cartilages become more and more angular and membranous, till at length they are found to be perfectly membranous, and at laſt become inviſible.

The trachea is furniſhed with fleſhy or muſcular fibres; ſome of which paſs through its whole extent longitudinally, while the others are carried round it in a circular direction; ſo that by the contraction or relaxation of theſe fibres, it is enabled to ſhorten or lengthen itſelf, and likewiſe to dilate or contract the diameter of its paſſage.

The trachea and its branches, in all their ramifications, are furniſhed with a great number of ſmall glands which are lodged in their cellular ſubſtance, and diſcharge a mucous fluid on the inner ſurface of theſe tubes.

The cartilages of the trachea, by keeping it conſtantly open, afford a free paſſage to the air, which we are obliged to be inceſſantly reſpiring; and its membranous part, by being capable of contraction and dilatation, enables us to receive and expel the air in a greater or leſs quantity, and with more or leſs velocity, as may be required in ſinging or in declamation. This membranous ſtructure of the trachea poſteriorly, ſeems likewiſe to aſſiſt in the deſcent of the food, by preventing that impediment to its paſſage down the œſophagus, which might be expected if the cartilages were complete rings.

The trachea receives its arteries from the carotid and ſubclavian arteries, and its veins paſs into the jugulars. Its nerves ariſe from the recurrent branch of the eighth pair, and from the cervical plexus.

Sect. VI. *Of the Lungs.*

117. The lungs fill the greater part of the cavity of the breaſt. They are of a ſoft and ſpongy texture, and are divided into two lobes, which are ſeparated from each other by the mediaſtinum, and are externally covered by a production of the pleura. Each of theſe is divided into two or three leſſer lobes; and we commonly find three in the right ſide of the cavity, and two in the left.

To diſcover the ſtructure of the lungs, it is required to follow the ramifications of the bronchi, which were deſcribed in the laſt ſection. Theſe becoming gradually more and more minute, at length terminate in the cellular ſpaces or veſicles, which make up the greateſt part of the ſubſtance of the lungs, and readily communicate with each other.

The lungs ſeem to poſſeſs but little ſenſibility. Their nerves, which are ſmall, and few in number, are derived from the intercoſtal and eighth pair. This laſt pair having reached the thorax, ſends off a branch on each ſide of the trachea, called the *recurrent*, which reaſcends at the back of the trachea, to which it furniſhes branches in its aſcent, as well as to the œſophagus, but it is chiefly diſtributed to the larynx and its muſcles. By dividing the recurrent and ſuperior laryngeal nerves at their origin, an animal is deprived of its voice.

There are two ſeries of arteries which carry blood to the lungs: theſe are the arteriæ bronchiales, and the pulmonary artery.

The arteriæ bronchiales begin uſually by two branches; one of which commonly ariſes from the right intercoſtal, and the other from the trunk of the aorta: but ſometimes there are three of theſe arteries, and in ſome ſubjects only one. The uſe of theſe arteries is to ſerve for the nouriſhment of the lungs, and their ramifications are ſeen creeping every where on the branches of the bronchi. The blood is brought back from them by the bronchial vein into the vena azygos.

The pulmonary artery and vein are not intended for the nouriſhment of the lungs; but the blood in its paſſage through them is deſtined to undergo ſome changes, or to acquire certain eſſential properties (from the action of the air), which it has loſt in its circulation through the other parts of the body. The pulmonary artery receives the blood from the right ventricle of the heart, and dividing into two branches, accompanies the bronchi every where, by its ramifications through the lungs; and the blood is afterwards conveyed back by the pulmonary vein, which gradually forming a conſiderable trunk, goes to empty itſelf into the left ventricle of the heart; ſo that the quantity of blood which enters into the lungs, is perhaps greater than that which is ſent in the ſame proportion of time through all the other parts of the body.

Sect. VII. *Of Reſpiration.*

Respiration conſtitutes one of thoſe functions which are properly termed *vital*, as being eſſential to life; for to live and to breathe are in fact ſynonymous terms. It conſiſts in an alternate contraction and dilatation of the thorax, by firſt inſpiring air into the lungs, and then expelling it from them in exſpiration. 118.

It will perhaps be eaſy to diſtinguiſh and point out the ſeveral phenomena of reſpiration; but to explain their phyſical cauſe will be attended with difficulty: for it will naturally be enquired, how the lungs, when emptied of the air, and contracted by exſpiration, become again inflated, they themſelves being perfectly paſſive? How the ribs are elevated in oppoſition to their own natural ſituation? and why the diaphragm is contracted downwards towards the abdomen? Were we to aſſert that the air, by forcing its way into the cavity of the lungs, dilated them, and conſequently elevated the ribs, and preſſed down the diaphragm, we ſhould ſpeak erroneouſly. What induces the firſt inſpiration, it is not eaſy to aſcertain; but after an animal has once reſpired, it would ſeem likely that the blood, after exſpiration, finding its paſſage through the lungs obſtructed, becomes a ſtimulus, which induces the intercoſtal muſcles and the diaphragm to contract, and enlarge the cavity of the thorax, in conſequence perhaps of a certain nervous influence, which we will not here attempt to explain. The air then ruſhes into the lungs; every branch of the bronchial tubes, and all the cellular ſpaces into which they open, become fully dilated; and the pulmonary veſſels being equally diſtended, the blood flows through them with eaſe. But as the ſtimulus which firſt occaſioned this dilatation ceaſes to operate, the muſcles gradually contract, the diaphragm riſes upwards again, and diminiſhes the cavity of the cheſt; the ribs return to their former ſtate; and as the air paſſes out in exſpiration, the lungs gradually collapſe, and a reſiſtance to the paſſage of the blood again takes place. But the heart continuing to receive and expel the blood,

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blood, the pulmonary artery begins again to be diſtended, the ſtimulus is renewed, and the ſame proceſs is repeated, and continues to be repeated, in a regular ſucceſſion during life: for though the muſcles of reſpiration, having a mixed motion, are (unlike the heart) in ſome meaſure dependent on the will, yet no human being, after having once reſpired, can live many moments without it. In an attempt to hold one's breath, the blood ſoon begins to diſtend the veins, which are unable to empty their contents into the heart; and we are able only, during a very little time, to reſiſt the ſtimulus to inſpiration. In drowning, the circulation ſeems to be ſtopped upon this principle; and in hanging, the preſſure made on the jugular veins, may cooperate with the ſtoppage of reſpiration in bringing on death.

Till within theſe few years phyſiologiſts were entirely ignorant of the uſe of reſpiration. It was at length diſcovered in part by the illuſtrious Dr Prieſtley. He found that the air exſpired by animals was phlogiſticated; and that the air was fitter for reſpiration, or for ſupporting animal life, in proportion as it was freer from the phlogiſtic principle. It had long been obſerved, that the blood in paſſing through the lungs acquired a more florid colour. He therefore ſuſpected, that it was owing to its having imparted phlogiſton to the air: and he ſatisfied himſelf of the truth of this idea by experiments, which ſhowed, that the craſſamentum of extravaſated blood, phlogiſticated air in proportion as it loſt its dark colour. He farther found, that blood thus reddened had a ſtrong attraction for phlogiſton; inſomuch that it was capable of taking it from phlogiſticated air, thereby becoming of a darker colour. From hence it appeared that the blood, in its circulation through the arterial ſyſtem, imbibes a conſiderable quantity of phlogiſton, which is diſcharged from it to the air in the lungs.

This diſcovery has ſince been proſecuted by two very ingenious phyſiologiſts, Dr Crawford and Mr Elliot. It had been ſhown by profeſſors Black and Irvine, that different bodies have different capacities for containing fire. For example, that oil and water, when equally hot to the ſenſe and the thermometer, contain different proportions of that principle; and that unequal quantities of it are required, in order to raiſe thoſe ſubſtances to like temperatures. The enquiries of Dr Crawford and Mr Elliot tend to prove, that the capacities of bodies for containing fire are diminiſhed by the addition of phlogiſton, and increaſed by its ſeparation: the capacity of calx of antimony, for example, being greater than that of the antimony itſelf. Common air contains a great quantity of fire; combuſtible bodies very little. In combuſtion, a double elective attraction takes place; the phlogiſton of the body being transferred to the air, the fire contained in the air to the combuſtible body. But as the capacity of the latter is not increaſed ſo much as that of the former is diminiſhed, only part of the extricated fire will be abſorbed by the body. The remainder therefore will raiſe the temperature of the compound; and hence we may account for the heat attending combuſtion. As the uſe of reſpiration is to dephlogiſticate the blood, it ſeems probable, that a like double elective attraction takes place in this proceſs; the phlogiſton of the blood being transferred to the air, and the fire contained in the air to the blood; but with this difference, that the capacities being equal, the whole of the extricated fire is abſorbed by the latter. The blood in this ſtate circulating through the body, imbibes phlogiſton, and of courſe gives out its fire; part only of which is abſorbed by the parts furniſhing the phlogiſton, the remainder, as in combuſtion, becoming ſenſible; and is therefore the cauſe of the heat of the body, or what is called animal heat.

In confirmation of this doctrine it may be obſerved, that the venous blood contains leſs fire than the arterial; combuſtible bodies leſs than incombuſtible ones; and that air contains leſs of this principle, according as it is rendered, by combination with phlogiſton, leſs fit for reſpiration (z).

In aſcending very high mountains, reſpiration is found to become ſhort and frequent, and ſometimes to be attended with a ſpitting of blood. Theſe ſymptoms ſeem to be occaſioned by the air being too rare and thin to dilate the lungs ſufficiently; and the blood gradually accumulating in the pulmonary veſſels, ſometimes burſts through their coats, and is brought up by coughing. This has likewiſe been accounted for in a different way, by ſuppoſing that the air contained in the blood, not receiving an equal preſſure from that of the atmoſphere, expands, and at length ruptures the very minute branches of the pulmonary veſſels; upon the ſame principle that fruits and animals put under the receiver of an air-pump, are ſeen to ſwell as the outer air becomes exhauſted. But Dr Darwin of Litchfield has lately publiſhed ſome experiments, which ſeem to prove, that no air or elaſtic vapour does exiſt in the blood-veſſels, as has been generally ſuppoſed; and he is induced to impute the ſpitting of blood which has ſometimes taken place in aſcending high mountains, to accident, or to violent exertions; as it never happens to animals that are put into the exhauſted receiver of an air-pump, where the diminution of preſſure is many times greater than on the ſummit of the higheſt mountains.

SECT. VIII. *Of the Voice.*

119. RESPIRATION has already been deſcribed as affording us many advantages; and next to that of life, its moſt important uſe ſeems to be that of forming the voice and ſpeech. The ancients, and almoſt all the moderns, have conſidered the organ of ſpeech as a kind of muſical inſtrument, which may be compared to a flute, to an hautboy, to an organ, &c. and they argue after the following manner.

The trachea, which begins at the root of the tongue, and goes to terminate in the lungs, may be compared to the pipe of an organ, the lungs dilating like bellows during the time of inſpiration; and as the air is driven out from them in exſpiration, it finds its paſſage ſtraitened by the cartilages of the larynx, againſt which it ſtrikes.

(z) See Crawford's Experiments and Obſervations on Animal Heat, and Elliot's Philoſophical Obſervations.

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ſtrikes. As theſe cartilages are more or leſs elaſtic, they occaſion in their turn more or leſs vibration in the air, and thus produce the ſound of the voice; the variation in the ſound and tone of which depends on the ſtate of the glottis, which, when ſtraitened, produces an acute tone, and a grave one when dilated.

The late M. Ferein communicated to the French Academy of Sciences a very ingenious theory on the formation of the voice. He conſidered the organ of the voice as a *ſtring*, as well as a *wind*, inſtrument; ſo that what art has hitherto been unable to conſtruct, and what both the fathers Merſenne and Kircher ſo much wiſhed to ſee, M. Ferein imagined he had at length diſcovered in the human body. He obſerves, that there are at the edges of the glottis certain tendinous chords, placed horizontally acroſs it, which are capable of conſiderable vibration, ſo as to produce ſound, in the ſame manner as it is produced by the ſtrings of a violin or a harpſichord: and he ſuppoſes that the air, as it paſſes out from the lungs, acts as a bow on theſe ſtrings, while the efforts of the breaſt and lungs regulate its motion, and produce the variety of tones. So that according to this ſyſtem the variation in the voice is not occaſioned by the dilatation or contraction of the glottis, but by the diſtenſion or relaxation of theſe ſtrings, the ſound being more or leſs acute in proportion as they are more or leſs ſtretched out. Another writer on this ſubject ſuppoſes, that the organ of voice is a double inſtrument, which produces in uniſon two ſounds of a different nature; one by means of the air, and the other by means of the chords of the glottis. Neither of theſe ſyſtems, however, are univerſally adopted. They are both liable to inſuperable difficulties; ſo that the manner in which the voice is formed has never yet been ſatisfactorily aſcertained: we may obſerve, however, that the ſound produced by the glottis is not articulated. To effect this, it is required to paſs through the mouth, where it is differently modified by the action of the tongue, which is either puſhed againſt the teeth, or upwards towards the palate; detaining it in its paſſage, or permitting it to flow freely, by contracting or dilating the mouth.

Sect. IX. *Of Dejection.*

120. By dejection we mean the act of voiding the feces at the anus; and an account of the manner in which this is conducted was reſerved for this part of the work, becauſe it ſeemed to require a knowledge of reſpiration to be perfectly underſtood.

The inteſtines were deſcribed as having a periſtaltic motion, by which the feces were gradually advancing towards the anus. Now, whenever the feces are accumulated in the inteſtinum rectum in a ſufficient quantity to become troubleſome, either by their weight or acrimony, they excite a certain uneaſineſs which induces us to go to ſtool.—To effect this, we begin by making a conſiderable inſpiration; in conſequence of which the diaphragm is carried downwards towards the lower belly; the abdominal muſcles are at the ſame time contracted in obedience to the will; and the inteſtines being compreſſed on all ſides, the reſiſtance of the *ſphincter* is overcome, and the feces paſs out at the anus; which is afterwards drawn up by its longitudinal fibres, which are called *levatores ani*, and then by means of its *ſphincter* is again contracted: but it ſometimes happens, as in dyſenteries for inſtance, that the feces are very liquid, and have conſiderable acrimony; and then the irritation they occaſion is more frequent, ſo as to promote their diſcharge without any preſſure from the diaphragm or abdominal muſcles; and ſometimes involuntarily, as is the caſe when the ſphincter becomes paralytic.

Sect. X. *Of the Pericardium, and of the Heart and its Auricles.*

The two membranous bags of the pleura, which were deſcribed as forming the mediaſtinum, recede one from the other, ſo as to afford a lodgment to a firm membranous ſac, in which the heart is ſecurely lodged; this ſac, which is the *pericardium*, appears to be compoſed of two tunics, united to each other by cellular membrane.—The outer coat, which is thick, and in ſome places of a tendinous complexion, is a production of the mediaſtinum; the inner coat, which is extremely thin, is reflected over the auricles and ventricles of the heart, in the ſame manner as the tunica conjunctiva, after lining the eye lids, is reflected over the eye. 121 Pericardium.

This bag adheres to the tendinous part of the diaphragm, and contains a coagulable lymph, the *liquor pericardii*, which ſerves to lubricate the heart and facilitate its motions; and ſeems to be ſecreted and abſorbed in the ſame manner as it is in the other cavities of the body.

The arteries of the pericardium are derived from the phrenic, and its veins paſs into veins of the ſame name; its nerves are likewiſe branches of the phrenic.

The ſize of the pericardium is adapted to that of the heart, being uſually large enough to contain it looſely. As its cavity does not extend to the ſternum, the lungs cover it in inſpiration; and as it every where inveſts the heart, it effectually ſecures it from being injured by lymph, pus, or any other fluid, extravaſated into the cavities of the thorax.

The heart is a hollow muſcle of a conical ſhape, ſituated tranſverſely between the two laminæ of the mediaſtinum, at the lower part of the thorax; having its baſis turned towards the right ſide, and its point or apex towards the left.—Its lower ſurface is ſomewhat flattened towards the diaphragm. Its baſis, from which the great veſſels originate, is covered with fat, and it has two hollow and fleſhy appendages, called *auricles*.—Round theſe ſeveral openings, the heart ſeems to be of a firm ligamentous texture, from which all its fibres ſeem to originate; and as they advance from thence towards the apex, the ſubſtance of the heart ſeems to become thinner. 122 Heart, and its auricles.

The heart includes two cavities or *ventricles*, which are ſeparated from each other by a fleſhy ſeptum; one of theſe is called the *right*, and the other the *left*, *ventricle*; though perhaps, with reſpect to their ſituation, it would be more proper to diſtinguiſh them into the *anterior* and *poſterior ventricles*.

The heart is exteriorly covered by a very fine membrane; and its ſtructure is perfectly muſcular or fleſhy, being compoſed of fibres which are deſcribed as paſſing in different directions; ſome as being extended longitudinally from the baſis to the apex; others, as taking an oblique or ſpiral courſe; and a third ſort as

being placed in a tranſverſe direction (A).—Within the two ventricles we obſerve ſeveral furrows; and there are likewiſe tendinous ſtrings, which ariſe from fleſhy *columnæ* in the two cavities, and are attached to the valves of the auricles: That the uſe of theſe and the other valves of the heart may be underſtood, it muſt be obſerved, that four large veſſels paſs out from the baſis of the heart, viz. two arteries and two veins; and that each of theſe veſſels is furniſhed with a thin membranous production, which is attached all round to the borders of their ſeveral orifices, from whence hanging looſely down they appear to be divided into two or three diſtinct portions. But as their uſes in the arteries and veins are different, ſo are they differently diſpoſed. Thoſe of the arteries are intended to give way to the paſſage of the blood into them from the ventricles, but to oppoſe its return: and, on the contrary, the valves of the veins are conſtructed ſo as to allow the blood only to paſs into the heart. In conſequence of theſe different uſes, we find the valves of the pulmonary artery and of the aorta attached to the orifices of thoſe veſſels, ſo as to have their concave ſurfaces turned towards the artery; and their convex ſurfaces, which mutually meet together, being placed towards the ventricle, only permit the blood to paſs one way, which is into the arteries. There are uſually three of theſe valves belonging to the pulmonary artery, and as many to the aorta; and from their figure they are called *valvulæ ſemilunares*. The communication between the two great veins and the ventricles is by means of the two appendages or auricles into which the blood is diſcharged; ſo that the other valves which may be ſaid to belong to the veins, are placed in each ventricle, where the auricle opens into it. The valves in the right ventricle are uſually three in number, and are named *valvulæ tricuſpides;* but in the left ventricle we commonly obſerve only two, and theſe are the *valvulæ mitrales*. The membranes which form theſe valves in each cavity are attached ſo as to project ſomewhat forward; and both the *tricuſpides* and the *mitrales* are connected with the tendinous ſtrings, which were deſcribed as ariſing from the fleſhy *columnæ*. By the contraction of either ventricle the blood is driven into the artery which communicates with that ventricle; and theſe tendinous ſtrings being gradually relaxed as the ſides of the cavity are brought nearer to each other, the valves naturally cloſe the opening into the auricle, and the blood neceſſarily directs its courſe into the then only open paſſage, which is into the artery; but after this contraction, the heart becomes relaxed, the tendinous ſtrings are again ſtretched out, and, drawing the valves of the auricle downwards, the blood is poured by the veins into the ventricle, from whence, by another contraction, it is again thrown into the artery, as will be deſcribed hereafter. The right ventricle is not quite ſo long, though ſomewhat larger, than the left; but the latter has more ſubſtance than the other: and this ſeems to be, becauſe it is intended to tranſmit the blood to the moſt diſtant parts of the body, whereas the right ventricle diſtributes it only to the lungs.

The heart receives its nerves from the par vagum and the intercoſtals. The arteries which ſerve for its nouriſhment are two in number, and ariſe from the aorta. They ſurround in ſome meaſure the baſis of the heart, and from this courſe are called the *coronary arteries*. From theſe arteries the blood is returned by veins of the ſame name into the auricles, and even into the ventricles.

The muſcular bags called the *auricles* are ſituated at the baſis of the heart, at the ſides of each other; and, correſponding with the two ventricles, are like thoſe two cavities diſtinguiſhed into *right* and *left*. Theſe ſacs, which are interiorly unequal, have externally a jagged appendix; which, from its having been compared to the extremity of an ear, has given them their name of *auricles*.

SECT. XI. *Angiology, or a Deſcription of the Blood-veſſels.*

THE heart has been deſcribed as contracting itſelf, 123.
and throwing the blood from its two ventricles into the pulmonary artery and the aorta, and then as relaxing itſelf and receiving a freſh ſupply from two large veins, which are the pulmonary vein and the vena cava. We will now point out the principal diſtributions of theſe veſſels.

The *pulmonary artery* ariſes from the right ventricle by a large trunk, which ſoon divides into two conſiderable branches, which paſs to the right and left lobes of the lungs: each of theſe branches is afterwards divided and ſubdivided into an infinite number of branches and ramifications, which extend through the whole ſubſtance of the lungs; and from theſe branches the blood is returned by the veins, which, contrary to the courſe of the arteries, begin by very minute canals, and gradually become larger, forming at length four large trunks called *pulmonary veins*, which terminate in the *left auricle* by one common opening, from whence the blood paſſes into the *left ventricle*. From this ſame ventricle ariſes the *aorta* or *great artery*, which at its beginning is nearly an inch in diameter: it ſoon ſends off two branches, the *coronaries*, which go to be diſtributed to the heart and its auricles. After this, at or about the third or fourth vertebra of the back, it makes a conſiderable curvature; from this curvature (B) ariſe three arteries; one of which ſoon divides into two branches. The firſt two are the left ſubclavian and the left carotid, and the third is a common trunk to the right ſubclavian and right carotid; though ſometimes both the carotids ariſe diſtinctly from the aorta.

The two *carotids* aſcend within the ſubclavians, along the ſides of the trachea; and when they have reached the larynx, divide into two principal branches, the *internal* and *external carotid*. The firſt of theſe runs a little

(A) Authors differ about the courſe and diſtinctions of theſe fibres; and it ſeems right to obſerve, that the ſtructure of the heart being more compact than that of other muſcles, its fibres are not eaſily ſeparated.

(B) Anatomiſts uſually call the upper part of this curvature *aorta aſcendens;* and the other part of the artery to its diviſion at the iliacs, *aorta deſcendens:* but they differ about the place where this diſtinction is to be introduced; and it ſeems ſufficiently to anſwer every purpoſe, to ſpeak only of the aorta and its curvature.

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little way backwards in a bending direction; and having reached the under part of the ear, passes through the canal in the os petrosum, and entering into the cavity of the cranium, is distributed to the brain and the membranes which invelope it, and likewise to the eye. The *external carotid* divides into several branches, which are distributed to the larynx, pharynx, and other parts of the neck; and to the jaws, lips, tongue, eyes, temples, and all the external parts of the head.

Each *subclavian* is likewise divided into a great number of branches. It sends off the *vertebral artery*, which passes through the openings we see at the bottom of the transverse processes of the vertebræ of the neck, and in its course sends off many ramifications to the neighbouring parts. Some of its branches are distributed to the spinal marrow, and after a considerable inflection it enters into the cranium, and is distributed to the brain. The *subclavian* likewise sends off branches to the muscles of the neck and scapula; and the mediastinum, thymus, pericardium, diaphragm, the breasts, and the muscles of the thorax, and even of the abdomen, derive branches from the subclavian, which are distinguished by different names, alluding to the parts to which they are distributed; as the *mammary*, the *phrenic*, the *intercostal*, &c. But notwithstanding the great number of branches which have been described as arising from the subclavian, it is still a considerable artery when it reaches the *axilla*, where it drops its former name, which alludes to its passage under the clavicle, and is called the *axillary* artery; from which a variety of branches are distributed to the muscles of the breast, scapula, and arm.—But its main trunk taking the name of *brachialis*, runs along on the inside of the arm near the os humeri, till it reaches the joint of the fore-arm, and then it divides into two branches. This division however is different in different subjects; for in some it takes place higher up and in others lower down. When it happens to divide above the joint, it may be considered as a happy disposition in case of an accident by bleeding; for supposing the artery to be unfortunately punctured by the lancet, and that the hæmorrhage could only be stopped by making a ligature on the vessel, one branch would remain unhurt, through which the blood would pass uninterrupted to the fore-arm and hand. One of the two branches of the brachialis plunges down under the flexor muscles, and runs along the edge of the ulna; while the other is carried along the outer surface of the radius, and is easily felt at the wrist, where it is only covered by the common integuments. Both these branches commonly unite in the palm of the hand, and form an arterial arch from whence branches are detached to the fingers.

The *aorta*, after having given off at its curvature the carotids and subclavians which convey blood to all the upper parts of the body, descends upon the bodies of the vertebræ a little to the left, as far as the os sacrum, where it drops the name of *aorta*, and divides into two considerable branches. In this course, from its curvature to its bifurcation, it sends off several arteries in the following order: 1. One or two little arteries, first demonstrated by Ruysch as going to the bronchi, and called *arteriæ bronchiales Ruyschii*. 2. The arteriæ œsophageæ. These are commonly three or four in number. They arise from the fore-part of the aorta, and are distributed chiefly to the œsophagus. 3. The inferior intercostal arteries, which are distributed between the ribs in the same manner as the arteries of the three or four superior ribs are, which are derived from the subclavian. These arteries send off branches to the medulla spinalis. 4. The diaphragmatic or inferior phrenic arteries, which go to the diaphragm, stomach, omentum, duodenum, pancreas, spleen, liver, and gall-bladder. 5. The cœliac, which sends off the coronary-stomachic, the splenic, and the hepatic artery. 6. The superior mesenteric artery, which is distributed to the mesentery and small intestines. 7. The emulgents, which go to the kidneys. 8. The arteries, which are distributed to the glandulæ renales. 9. The spermatic. 10. The inferior mesenteric artery, which ramifies through the lower portion of the mesentery and the large intestines.—A branch of this artery which goes to the rectum is called the *internal hæmorrhoidal*. 11. The lumbar arteries, and a very small branch called the *sacra*, which are distributed to the muscles of the loins and abdomen, and to the os sacrum and medulla spinalis.

The trunk of the aorta, when it has reached the last vertebra lumborum, or the os sacrum, drops the name of *aorta*, and separates into two forked branches called the *iliacs*. Each of these soon divides into two branches; one of which is called the *internal iliac*, or *hypogastric artery*, and is distributed upon the contents of the pelvis and upon the muscles on its outer side. One branch called *pudenda communis*, sends small ramifications to the end of the rectum under the name of *hæmorrhoidales externæ*, and is afterwards distributed upon the penis. The other branch, the external iliac, after having given off the circumflex artery of the os ilium and the epigastric, which is distributed to the recti-muscles, passes out of the abdomen under Poupart's ligament, and takes the name of *crural artery*. It descends on the inner part of the thigh close to the os femoris, sending off branches to the muscles, and then sinking deeper in the hind part of the thigh, reaches the ham, where it takes the name of *popliteal:* after this it separates into two considerable branches; one of which is called the *anterior tibial artery*; the other divides into two branches, and these arteries all go to be distributed to the leg and foot.

The blood, which is thus distributed by the aorta to all parts of the body, is brought back by the veins, which are supposed to be continued from the ultimate branches of arteries; and uniting together as they approach the heart, at length form the large trunks, the vena cava ascendens, and vena cava descendens.

All the veins which bring back the blood from the upper extremities, and from the head and breast, pass into the vena cava descendens; and those which return it from the lower parts of the body terminate in the vena cava ascendens; and these two cavas uniting together as they approach the heart, open by one common orifice into the left auricle.

It does not here seem to be necessary to follow the different divisions of the veins as we did those of the arteries; and it will be sufficient to remark, that in general every artery is accompanied by its vein, and that both are distinguished by the same name. But, like

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like many other general rules, this too has its exceptions (c). The veins, for inſtance, which accompany the external and internal carotid, are not called the *carotid veins*, but the *external* and *internal jugular*.—In the thorax there is a vein diſtinguiſhed by a proper name, and this is the *azygos*, or *vena ſine pari*. This vein, which is a pretty conſiderable one, runs along by the right ſide of the vertebræ of the back, and is chiefly deſtined to receive the blood from the intercoſtals on that ſide, and from the lower half of thoſe on the left ſide, and to convey it into the vena cava deſcendens. In the abdomen we meet with a vein, which is ſtill a more remarkable one, and this is the *vena portæ*, which performs the office both of an artery and a vein. It is formed by a re-union of all the veins which come from the ſtomach, inteſtines, omentum, pancreas, and ſpleen, ſo as to compoſe one great trunk, which goes to ramify through the liver; and after having depoſited the bile, its ramifications unite and bring back into the vena cava, not only the blood which the vena portæ had carried into the liver, but likewiſe the blood from the hepatic artery. Every artery has a vein which correſponds with it; but the trunks and branches of the veins are more numerous than thoſe of the arteries.—The reaſons for this diſpoſition are perhaps not difficult to be explained; the blood in its courſe through the veins is much farther removed from the ſource and cauſe of its motion, which are in the heart, than it was when in the arteries; ſo that its courſe is conſequently leſs rapid, and enough of it could not poſſibly be brought back to the heart in the moment of its dilatation, to equal the quantity which is driven into the arteries from the two ventricles, at the time they contract; and the equilibrium, which is ſo eſſential to the continuance of life and health, would conſequently be deſtroyed, if the capacity of the veins did not exceed that of the arteries, in the ſame proportion that the rapidity of the blood's motion through the arteries exceeds that of its return through the veins.

A large artery ramifying through the body, and continued to the minute branches of veins, which gradually unite together to form a large trunk, may be compared to two trees united to each other at their tops; or rather as having their ramifications ſo diſpoſed that the two trunks terminate in one common point; and if we farther ſuppoſe, that both theſe trunks and their branches are hollow, and that a fluid is inceſſantly circulated through them, by entering into one of the trunks and returning through the other, we ſhall be enabled to conceive how the blood is circulated through the veſſels of the human body.

Every trunk of an artery, before it divides, is nearly cylindrical, or of equal diameter through its whole length, and ſo are all its branches when examined ſeparately. But every trunk ſeems to contain leſs blood than the many branches do into which that trunk ſeparates; and each of theſe branches probably contains leſs blood than the ramifications do into which it is ſubdivided: and it is the ſame with the veins; the volume of their ſeveral ramifications, when conſidered together, being found to exceed that of the great trunk which they form by their union.

The return of the blood through the veins to the heart, is promoted by the action of the muſcles, and the pulſation of the arteries. And this return is likewiſe greatly aſſiſted by the *valves* which are to be met with in the veins, and which conſtitute one of the great diſtinctions between them and the arteries. Theſe valves, which are ſuppoſed to be formed by the inner coat of the veins, permit the blood to flow from the extremities towards the heart, but oppoſe its return. They are moſt frequent in the ſmaller veins. As the column of blood increaſes, they ſeem to become leſs neceſſary; and therefore in the vena cava aſcendens, we meet with only one valve, which is near its origin.

The arteries are compoſed of ſeveral tunics. Some writers enumerate five of theſe tunics; but perhaps we may more properly reckon only three, viz. the *nervous*, *muſcular*, and *cuticular* coats. The veins are by ſome anatomiſts deſcribed as having the ſame number of coats as the arteries; but as they do not ſeem to be irritable, we cannot with propriety ſuppoſe them to have a muſcular tunic. We are aware of Dr Verſchuir's experiments to prove that the jugular and ſome other veins poſſeſs a certain degree of irritability; but it is certain, that his experiments, repeated by others, have produced a different reſult; and even he himſelf allows, that ſometimes he was unable to diſtinguiſh any ſuch property in the veins. Both theſe ſeries of veſſels are nouriſhed by ſtill more minute arteries and veins, which are ſeen creeping over their coats, and ramifying through their whole ſubſtance, and are called *vaſa vaſorum*; they have likewiſe many minute branches of nerves.

* *De Arteriarum et Venerum vi irritabili*, 4to.

The arteries are much ſtronger than the veins, and they ſeem to require this force to be enabled to reſiſt the impetus with which the blood circulates through them, and to impel it on towards the veins.

When the heart contracts, it impels the blood into the arteries, and ſenſibly diſtends them; and theſe veſſels again contract, as the heart becomes relaxed to receive more blood from the auricles; ſo that the cauſe of the contraction and dilatation of the *arteries* ſeems to be eaſy to be underſtood, being owing in part to their own contractile power, and in part to the action of the heart; but in the *veins*, the effects of this impulſe not being ſo ſenſibly felt, and the veſſels themſelves having little or no contractile power, the blood ſeems to flow in a conſtant and equal ſtream: and this, together with its paſſing gradually from a ſmall channel into a larger one, ſeems to be the reaſon why the *veins* have no pulſatory motion, except the large ones near the heart; and in theſe it ſeems to be occaſioned by the motion of the diaphragm, and by the regurgitation of the blood in the *cavas*.

SECT.

(c) In the extremities, ſome of the deep-ſeated veins, and all the ſuperficial ones, take a courſe different from that of the arteries.

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SECT. XII. *Of the Action of the Heart, Auricles, and Arteries.*

124. THE heart, at the time it contracts, drives the blood from its ventricles into the arteries; and the arteries being thus filled and distended, are naturally inclined to contract the moment the heart begins to dilate, and ceases to supply them with blood. These alternate motions of contraction and dilatation of the heart and arteries, are distinguished by the names of *systole* and *diastole*. When the heart is in a state of contraction or systole, the arteries are at that instant distended with blood, and in their diastole; and it is in this state we feel their pulsatory motion, which we call the *pulse*. When the heart dilates, and the arteries contract, the blood is impelled onwards into the veins, through which it is returned back to the heart. While the heart, however, is in its systole, the blood cannot pass from the veins into the ventricles, but is detained in the auricles, which are two reservoirs formed for this use, till the diastole, or dilatation of the heart, takes place; and then the distended auricles contract, and drive the blood into the ventricles: so that the auricles have an alternate systole and diastole as well as the heart.

Although both the ventricles of the heart contract at the same time, yet the blood passes from one to the other. In the same moment, for instance, that the left ventricle drives the blood into the aorta, the right ventricle impels it into the pulmonary artery, which is distributed through all the substance of the lungs. The blood is afterwards brought back into the left ventricle by the pulmonary vein, at the same time that the blood is returned by the cavas, into the right ventricle, from all the other parts of the body.

This seems to be the mode of action of the heart and its vessels: but the cause of this action has, like all other intricate and interesting subjects, been differently explained. It seems to depend on the stimulus made on the different parts of the heart by the blood itself, which by its quantity and heat, or other properties (D), is perhaps capable of first exciting that motion, which is afterwards continued through life, independent of the will, by a regular return of blood to the auricles, in a quantity proportioned to that which is thrown into the arteries.

The heart possesses the *vis insita*, or principle of irritability, in a much greater degree than any other muscle of the body. The pulse is quicker in young than in old subjects, because the former are *cæt. par.* more irritable than the latter. Upon the same principle we may explain, why the pulse is constantly quicker in weak than in robust persons.

SECT. XIII. *Of the Circulation.*

125. AFTER what has been observed of the structure and action of the heart and its auricles, and likewise of the arteries and veins, there seem to be but very few arguments required to demonstrate the *circulation of the blood*, which has long since been established as a medical truth. This circulation may be defined to be a perpetual motion of the blood, in consequence of the action of the heart and arteries, which impel it through all the parts of the body, from whence it is brought back by the veins to the heart.

A very satisfactory proof of this circulation, and a proof easy to be understood, may be deduced from the different effects of pressure on an artery and a vein. If a ligature, for instance, is passed round an artery, the vessel swells considerably between the ligature and the heart; whereas if we tie up a vein, it only becomes filled between the extremity and the ligature, and this is what we every day observe in bleeding. The ligature we pass round the arm on these occasions, compresses the superficial veins; and the return of the blood through them being impeded, they become distended. When the ligature is too loose, the veins are not sufficiently compressed, and the blood continues its progress towards the heart; and, on the contrary, when it is made too tight, the arteries themselves become compressed; and the flow of the blood through them being impeded, the veins cannot be distended.

Another phænomenon, which effectually proves the circulation, is the loss of blood that every living animal sustains by opening only a single artery of a moderate size; for it continues to flow from the wounded vessel till the equilibrium is destroyed which is essential to life. This truth was not unknown to the ancients; and it seems strange that it did not lead them to a knowledge of the circulation, as it sufficiently proves, that all the other vessels must communicate with that which is opened. Galen, who lived more than 1500 years ago, drew this conclusion from it; and if we farther observe, that he describes (after Erasistratus, who flourished about 450 years before him) the several valves of the heart, and determines their disposition and uses, it will appear wonderful, that a period of near 2000 years should afterwards elapse before the true course of the blood was ascertained. This discovery, for which we are indebted to the immortal Harvey, has thrown new lights on physiology and the doctrine of diseases, and constitutes one of the most important periods of anatomical history.

SECT. XIV. *Of the Nature of the Blood.*

126. BLOOD, recently drawn from a vein into a bason, would seem to be an homogeneous fluid of a red colour (E); but when suffered to rest, it soon coagulates, and divides into two parts, which are distinguished by the names of *crassamentum* and *serum*. The crassamentum is the red coagulum, and the serum is the water in which it floats. Each of these may be again separated into two others; for the crassamentum, by being repeatedly

(D) Dr Harvey long ago suggested, that the blood is possessed of a living principle; and Mr J. Hunter has lately endeavoured to revive this doctrine; in support of which he has adduced many ingenious arguments. The subject is a curious one, and deserves to be prosecuted as an inquiry which cannot but be interesting to physiologists.

(E) The blood, as it flows through the arteries, is observed to be more florid than it is in the veins; and this redness is acquired in its passage through the lungs. *Vid.* sect. vii.

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repeatedly washed in warm water, gives out all its red globules, and what remains appears to be composed of the coagulable lymph (F), which is a gelatinous substance, capable of being hardened by fire till it becomes perfectly horny: and if we expose the serum to a certain degree of heat, part of it will be found to coagulate like the white of an egg, and there will remain a clear and limpid water, resembling urine both in its appearance and smell.

The serum and crassamentum differ in their proportion in different constitutions; in a strong person, the crassamentum is in a greater proportion to the serum than in a weak one*; and the same difference is found to take place in diseases (G).

* *Hewson's Experim. Enq.* Part I.

Sect. XV. *Of Nutrition.*

127. The variety of functions which we have described as being incessantly performed by the living body, and the continual circulation of the blood through it, must necessarily occasion a constant dissipation of the several parts which enter into its composition. In speaking of the insensible perspiration, we observed how much was incessantly passing off from the lungs and the surface of the skin. The discharge by urine is likewise every day considerable; and great part of the bile, saliva, &c. are excluded by stool. But the solid, as well as the fluid parts of the body, require a constant renewal of nutritious particles. They are exposed to the attrition of the fluids which are circulated through them; and the contraction and relaxation they repeat so many thousand times in every day, would necessarily occasion a dissolution of the machine, if the renewal was not proportioned to the waste.

It is easy to conceive how the chyle formed from the aliment is assimilated into the nature of blood, and repairs the loss of the fluid parts of our body; but how the solids are renewed, has never yet been satisfactorily explained. The nutritious parts of the blood are probably deposited by the arteries by exsudation through their pores into the tela cellulosa; and as the solid parts of the body are in the embryo only a kind of jelly, which gradually acquires the degree of consistence they are found to have when the body arrives at a more advanced age; and these same parts which consist of bones, cartilages, ligaments, muscles, &c. are sometimes reduced again by disease to a gelatinous state; we may, with some degree of probability, consider the coagulable lymph as the source of nutrition.

If the supply of nourishment exceeds the degree of waste, the body increases; and this happens in infancy and in youth: for at those periods, but more particularly the former one, the fluids bear a large proportion to the solids; and the fibres being soft and yielding, are proportionably more capable of extension and increase. But when the supply of nutrition only equals the waste, we neither increase nor decrease; and we find this to be the case when the body has attained its full growth or *acme:* for the solids having then acquired a certain degree of firmness and rigidity, do not permit a farther increase of the body. But as we approach to old age, rigidity begins to be in excess, and the fluids (H) bear a much less proportion to the solids than before. The dissipation of the body is greater than the supply of nourishment; many of the smaller vessels become gradually impervious (I); and the fibres losing their moisture and their elasticity, appear flaccid and wrinkled. The lilies and the roses disappear, because the fluids by which they were produced can no longer reach the extremities of the capillary vessels of the skin. As these changes take place, the nervous power being proportionably weakened, the irritability and sensibility of the body, which were formerly so remarkable, are greatly diminished; and in advanced life, the hearing, the eye-sight, and all the other senses, become gradually impaired.

Sect. XVI. *Of the Glands and Secretions.*

The glands are commonly understood to be small, roundish, or oval bodies, formed by the convolution of a great number of vessels, and destined to separate particular humours from the mass of blood. 128.

They are usually divided into two classes; but it seems more proper to distinguish three kinds of glands, viz. the mucous, conglobate, and conglomerate.

The *mucous glands*, or follicles as they are most commonly called, are small cylindrical tubes continued from

(F) It may not be improper to observe, that till of late the *coagulable lymph* has been confounded with the *serum* of the blood, which contains a substance that is likewise coagulable, though only when exposed to heat, or combined with certain chemical substances; whereas the other coagulates spontaneously when exposed to the air or to rest.

(G) When the blood separates into *serum* and *crassamentum*, if the latter be covered with a crust of a whitish or buff colour, it has been usually considered as a certain proof of the blood's being in a state of too great viscidity. This appearance commonly taking place in inflammatory diseases, has long served to confirm the theory which ascribes the cause of inflammation to lentor and obstructions. But from the late Mr Hewson's experiments it appears, that when the action of the arteries is increased, the blood, instead of being more viscid, is, on the contrary, more fluid than in the ordinary state, previous to inflammation: and that in consequence of this, the coagulable lymph suffers the red globules, which are the heaviest part of the blood, to fall down to the bottom before it coagulates: so that the crassamentum is divided into two parts; one of which is found to consist of the coagulable lymph alone (in this case termed the *buff);* and the other, partly of this and partly of the red globules.

(H) As the fluids become less in proportion to the solids, their acrimony is found to increase; and this may perhaps compensate for the want of fluidity in the blood, by diminishing its cohesion.

(I) In infancy, the arteries are numerous and large in respect to the veins, and the lymphatic glands are larger than at any other time of life; whereas, in old age, the capacity of the venous system exceeds that of the arteries, and the lymphatic system almost disappears.

from the ends of arteries. In ſome parts of the body, as in the tonſils, for example, ſeveral of theſe follicles may be ſeen folded together in one common covering, and opening into one common ſinus. Theſe follicles are the veſſels that ſecrete and pour out mucus in the mouth, œſophagus, ſtomach, inteſtines, and other parts of the body.

The *conglobate glands* are peculiar to the lymphatic ſyſtem. Every lymphatic vein paſſes through a gland of this kind in its way to the thoracic duct. They are met with in different parts of the body, particularly in the axilla, groin, and meſentery, and are either ſolitary or in diſtinct cluſters.

The *conglomerate glands* are of much greater bulk than the conglobate, and ſeem to be an aſſemblage of many ſmaller glands. Of this kind are the liver, kidnies, &c. Some of them, as the pancreas, parotids, &c. have a granulated appearance. All theſe conglomerate glands are plentifully ſupplied with blood-veſſels; but their nerves are in general very minute, and few in number. Each little granulated portion furniſhes a ſmall tube, which unites with other ſimilar ducts, to form the common excretory duct of the gland.

The principal glands, and the humours they ſecrete, have been already deſcribed in different parts of this work; and there only remains for us to examine the general ſtructure of the glands, and to explain the mechaniſm of ſecretion. On the firſt of theſe ſubjects two different ſyſtems have been formed; each of which has had, and ſtill continue to have, its adherents. One of theſe ſyſtems was advanced by Malpighi, who ſuppoſed that an artery entering into a gland ramifies very minutely through its whole ſubſtance; and that its branches ultimately terminate in a veſicular cavity or follicle, from whence the ſecreted fluid paſſes out through the excretory duct. This doctrine at firſt met with few opponents; but the celebrated Ruyſch, who firſt attempted minute injections with wax, afterwards diſputed the exiſtence of theſe follicles, and aſſerted, that every gland appears to be a continued ſeries of veſſels, which after being repeatedly convoluted in their courſe through its ſubſtance, at length terminate in the excretory duct. Anatomiſts are ſtill divided between theſe two ſyſtems: that of Malpighi, however, ſeems to be the beſt founded.

The mode of ſecretion has been explained in a variety of ways, and they are all perfectly hypothetical. In ſuch an inquiry, it is natural to aſk, how one gland conſtantly ſeparates a particular humour, while another gland ſecretes one of a very different nature from the blood? The bile, for inſtance, is ſeparated by the liver, and the urine by the kidneys. Are theſe ſecretions to be imputed to any particular diſpoſition in the fluids, or is their cauſe to be looked for in the ſolids?

It has been ſuppoſed, that every gland contains within itſelf a fermenting principle, by which it is enabled to change the nature of the blood it receives, and to endue it with a particular property. So that, according to this ſyſtem, the blood, as it circulates through the kidneys, becomes mixed with the fermenting principle of thoſe glands, and a part of it is converted into urine; and again, in the liver, in the ſalival and other glands, the bile, the ſaliva, and other juices, are generated from a ſimilar cauſe. But it ſeems to be impoſſible for any liquor to be confined in a place expoſed to the circulation, without being carried away by the torrent of blood, every part of which would be equally affected; and this ſyſtem of fermentation has long been rejected as vague and chimerical. But as the cauſe of ſecretion continued to be looked for in the fluids, the former ſyſtem was ſucceeded by another, in which recourſe was had to the analogy of the humours. It was obſerved, that if paper is moiſtened with water, and oil and water are afterwards poured upon it, that the water only will be permitted to paſs through it; but that, on the other hand, if the paper has been previouſly ſoaked in oil inſtead of water, the oil only, and not the water, will be filtered through it. Theſe obſervations led to a ſuppoſition, that every ſecretory organ is originally furniſhed with a humour analogous to that which it is afterwards deſtined to ſeparate from the blood; and that in conſequence of this diſpoſition, the ſecretory veſſels of the liver, for inſtance, will only admit the bilious particles of the blood, while all the other humours will be excluded. This ſyſtem is an ingenious one, but the difficulties with which it abounds are unanſwerable: for oil and water are immiſcible; whereas the blood, as it is circulated through the body, appears to be an homogeneous fluid. Every oil will paſs through a paper moiſtened only with one kind of oil; and wine, or ſpirits mixed with water, will eaſily be filtered through a paper previouſly ſoaked in water. Upon the ſame principle, all our humours, though differing in their other properties, yet agreeing in that of being perfectly miſcible with each other, will all eaſily paſs through the ſame filtre.—But theſe are not all the objections to this ſyſtem. The humours which are ſuppoſed to be placed in the ſecretory veſſels for the determination of ſimilar particles from the blood, muſt be originally ſeparated without any analogous fluid; and that which happens once, may as eaſily happen always. Again, it ſometimes happens, from a vicious diſpoſition, that humours are filtered through glands which are naturally not intended to afford them a paſſage; and when this once has happened, it ought, according to this ſyſtem, to be expected always to do ſo: whereas this is not the caſe; and we are, after all, naturally led to ſeek for the cauſe of ſecretion in the ſolids. It does not ſeem right to aſcribe it to any particular figure of the ſecretory veſſels; becauſe the ſoft texture of thoſe parts does not permit them to preſerve any conſtant ſhape, and our fluids ſeem to be capable of accommodating themſelves to every kind of figure. Some have imputed it to the difference of diameter in the orifices of the different ſecretory veſſels. To this doctrine objections have likewiſe been raiſed; and it has been argued, that the veſſels of the liver, for inſtance, would, upon this principle, afford a paſſage not only to the bile, but to all the other humours of leſs conſiſtence with it. In reply to this objection, it has been ſuppoſed, that ſecondary veſſels exiſt, which originate from the firſt, and permit all the humours thinner than the bile to paſs through them.

Each of theſe hypotheſes is probably very remote from the truth.

EXPLANATION of PLATE XXIII.

This Plate repreſents the Heart in ſitu, all the large Arteries and Veins, with ſome of the Muſcles, &c.

Muscles, &c.—Superior Extremity.—a, Maſſeter. b, Complexus. C, Digaſtricus. d, Os hyoides. e, Thyroid gland. f, Levator ſcapulæ. g, Cucullaris. h h, The clavicles cut. i, The deltoid muſcle. k, Biceps flexor cubiti cut. l, Coraco-brachialis. m, Triceps extenſor cubiti. n, The heads of the pronator teres, flexor carpi radiales, and flexor digitorum ſublimus, cut. o, The flexor carpi ulnaris, cut at its extremity. p, Flexor digitorum profundus. q, Supinator radii longus, cut at its extremity. r, Ligamentum carpi tranſverſale. s, Extenſores carpi radiales. t, Latiſſimus dorſi. u, Anterior edge of the ſerratus anticus major. v v, The inferior part of the diaphragm. w w, Its anterior edge cut. x x, The kidneys. y, Tranſverſus abdominis. z, Os ilium.

Inferior Extremity.—*a*, Pſoas magnus. *b*, Iliacus internus. *c*, The fleſhy origin of the tenſor vaginæ femoris. *d d*, The oſſa pubis cut from each other. *e*, Muſculus pectineus cut from its origin. *f*, Short head of the triceps adductor femoris cut. *g*, The great head of the triceps. *h*, The long head cut. *i*, Vaſtas internus. *k*, Vaſtas externus. *l*, Crureus. *m*, Gemellus. *n*, Soleus. *o*, Tibia. *p*, Peronæus longus. *q*, Peronæus brevis. *r*, Fibula.

Heart and Blood-vessels.—A, the heart, with the coronary arteries and veins. B, The right auricle of the heart. C, The aorta aſcendens. D, The left ſubclavian artery. E, The left carotid artery. F, The common trunk which ſends off the right ſubclavian and right carotid arteries. G, The carotis externa. H, Arteria facialis, which ſends off the coronary arteries of the lips. I, Arteria temporalis profunda. K, Aorta deſcendens. L L, The iliac arteries,—which ſend off M M, The femoral or crural arteries. *N. B.* The other arteries in this figure have the ſame diſtribution as the veins of the ſame name:—And generally, in the anatomical plates, the deſcription to be found on the one ſide, points out the ſame parts in the other. 1, The frontal vein. 2, The facial vein. 3, Vena temporalis profunda. 4, Vena occipitalis. 5, Vena jugularis externa. 6, Vena jugularis interna, covering the arteria carotis communis. 7, The vaſcular arch on the palm of the hand, which is formed by, 8, the radial artery and vein, and, 9, the ulnar artery and vein. 10 10, Cephalic vein. 11, Baſilic vein, that on the right ſide, cut. 12, Median vein. 13, The humeral vein, which, with the median, covers the humeral artery. 14 14, The external thoracic or mammary arteries and veins. 15, The axillary vein, covering the artery. 16 16, The ſubclavian veins, which, with (6 6) the jugulars, form, 17, The vena cava ſuperior. 18, The cutaneous arch of veins on the fore part of the foot. 19, The vena tibialis antica, covering the artery. 20, The vena profunda femoris, covering the artery. 21, The upper part of the vena ſaphena major. 22, The femoral vein. 23 23, The iliac veins. 24 24, Vena cava inferior. 25 25, The renal veins covering the arteries. 26 26, The diaphragmatic veins.

PART V. Of the BRAIN and NERVES.

Sect. I. *Of the Brain and its Integuments.*

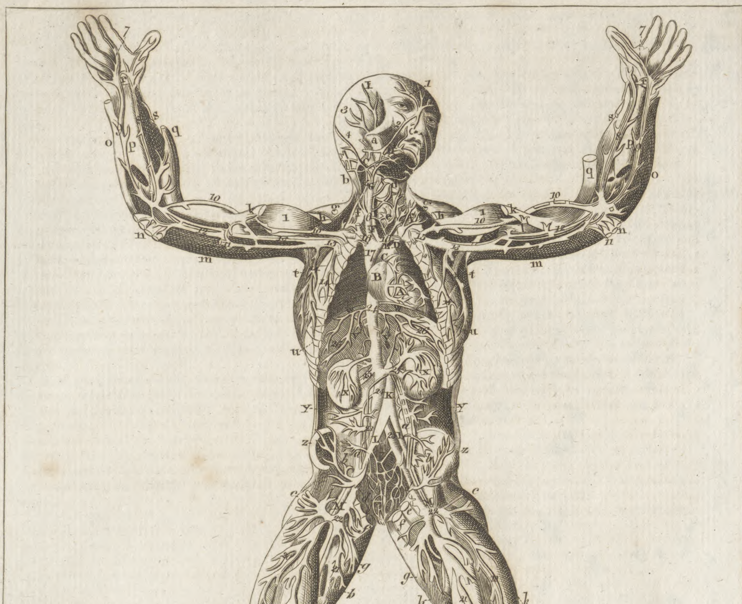
329. The bones of the cranium were deſcribed in the oſteological part of this work, as incloſing the brain, and defending it from external injury: but they are not its only protection; for when we make an horizontal

130 Integuments of the brain. ſection through theſe bones, we find this maſs everywhere ſurrounded by two membranes (K), the dura and pia mater.—The firſt of theſe lines the interior ſurface of the cranium, to which it everywhere adheres ſtrongly (L), but more particularly at the ſutures, and at the many foramina through which veſſels paſs between it and the pericranium. The *dura mater* (M) is perfectly ſmooth and inelaſtic, and its inner ſurface is conſtantly bedewed with a fine pellucid fluid, which everywhere ſeparates it from the pia mater. The dura mater ſends off ſeveral conſiderable proceſſes, which divide the brain into ſeparate portions, and prevent them from compreſſing each other. Of theſe proceſſes there is one ſuperior and longitudinal, called the *falx*, or *falciform proceſs*, from its reſemblance to a ſcythe. It ariſes from the ſpine of the os frontis, near the criſta galli, and extending along in the direction of the ſagittal ſuture, to beyond the lamboidal ſuture, divides the brain into two hemiſ-

(K) The Greeks called theſe membranes *meninges*; but the Arabians, ſuppoſing them to be the ſource of all the other membranes of the body, afterwards gave them the names of *dura* and *pia mater*; by which they are now uſually diſtinguiſhed.

(L) In young ſubjects this adheſion is greater than in adults; but even then, in the healthy ſubject, it is no where eaſily ſeparable, without breaking through ſome of the minute veſſels by means of which it is attached to the bone.

(M) This membrane is commonly deſcribed as conſiſting of two laminæ; of which the external one is ſuppoſed to perform the office of perioſteum internum to the cranium, while the internal one forms the folds and proceſſes of the dura mater. In the natural ſtate, however, no ſuch ſeparation is apparent; like other membranes, we may indeed divide it, not into two only, but many laminæ; but this diviſion is artificial, and depends on the dexterity of the anatomiſt.



A Bell Sculp^t

hemifpheres. A little below the lamboidal future, it divides into two broad wings or expanfions called the *tranfverfe* or *lateral proceffes*, which prevents the lobes of the cerebrum from preffing on the cerebellum. Befides thefe there is a fourth, which is fituated under the tranfverfe proceffes, and being continued to the fpine of the occiput, divides the cerebellum into two lobes.

The blood, after being diftributed through the cavity of the cranium by means of the arteries, is returned, as in the other parts of the body, by veins which all pafs on to certain channels, fituated behind thefe feveral proceffes.

Thefe canals or finufes communicate with each other, and empty themfelves into the internal jugular veins, which convey the blood into the vena cava. They are in fact triangular veins, running through the fubftance of the dura mater, and, like the proceffes, are diftinguifhed into *longitudinal* and *lateral;* and where thefe three meet, and where the fourth procefs paffes off, we obferve a fourth finus, which is called *torcular;* Herophilus, who firft defcribed it, having fuppofed that the blood at the union of thefe two veins, is, as it were, in a prefs.

Befides thefe four canals, which were known to the ancients, modern anatomifts enumerate many others, by giving the appellation of *finufes* to other veins of the dura mater, which for the moft part empty themfelves into fome of thofe we have juft now defcribed. There are the inferior longitudinal finus, the fuperior and inferior petrous finufes, the cavernous finufes, the circular finus, and the anterior and pofterior occipital finufes.

Thefe finufes or veins, by being conveyed through a thick denfe membrane, firmly fufpended, as the dura mater is, within the cranium, are lefs liable to rupture; at the fame time they are well fupported, and by running everywhere along the inner furface of the bones, they are prevented from preffing on the fubftance of the brain. To prevent too great a dilatation of them, we find filaments (called *chordæ Willifii*, from their having been firft noticed by Willis) ftretched acrofs their cavities; and the oblique manner in which the veins from the brain run through the fubftance of the brain into thefe channels, ferves the purpofe of a valve, which prevents the blood from turning back into the fmaller and weaker veffels of the brain.

The *pia mater* is a much fofter and finer membrane than the dura mater; being exceedingly delicate, tranfparent, and vafcular. It invefts every part of the brain, and fends off an infinite number of elongations, which infinuate themfelves between the convolutions, and even into the fubftance of the brain. This membrane is compofed of two laminæ; of which the exterior one is named *tunica arachnoidea*, from its thinnefs, which is equal to that of a fpider's web. Thefe two laminæ are intimately adherent to each other at the upper part of the brain, but are eafily feparable at the bafis of the brain, and through the whole length of the medulla fpinalis. The external layer, or tunica arachnoidea, appears to be fpread uniformly over the furface of the brain, but without entering into its furrows as the inner layer does; the latter being found to infinuate itfelf between the convolutions, and even into the interior cavities of the brain. The blood-veffels of the brain are diftributed through it in their way to that organ, and are therefore divided into very minute ramifications, before they penetrate the fubftance of the brain.

Of the Brain and Nerves.

131 The brain.

There are feveral parts included under the general denomination of *brain*. One of thefe, which is of the fofteft confiftence, and fills the greateft part of the cavity of the cranium, is the *cerebrum*, or *brain* properly fo called. Another portion, which is feated in the inferior and pofterior part of the head, is the *cerebellum;* and a third, which derives its origin from both thefe, is the *medulla oblongata*.

132 Cerebrum.

The *cerebrum* is a medullary mafs of a moderate confiftence, filling up exactly all the upper part of the cavity of the cranium, and divided into two hemifpheres by the falx of the dura mater. Each of thefe hemifpheres is ufually diftinguifhed into *an interior*, *a middle*, and *a pofterior lobe*. The firft of thefe is lodged on the orbital proceffes of the os frontis; the middle lobes lie in the middle foffæ of the bafis of the cranium, and the pofterior lobes are placed on the tranfverfe feptum of the os occipitis, immediately over the cerebellum, from which they are feparated by the lateral proceffes of the dura mater. Thefe two portions afford no diftinguifhing mark of feparation; and on this account Haller, and many other modern anatomifts, omit the diftinction of middle lobe, and fpeak only of the anterior and pofterior lobes of the brain.

The cerebrum appears to be compofed of two diftinct fubftances. Of thefe, the exterior one, which is of a greyifh or afh-colour, is called the *cortex*, and is fomewhat fofter than the other, which is very white, and is called *medulla*, or *fubftantia alba*.

After having removed the falx, and feparated the two hemifpheres from each other, we perceive a white convex body, the corpus callofum, which is a portion of the medullary fubftance, uniting the two hemifpheres to each other, and not invefted by the cortex. By making an horizontal incifion in the brain, on a level with this corpus callofum, we difcover two oblong cavities, named the *anterior* or *lateral ventricles*, one in each hemifphere. Thefe two ventricles, which communicate with each other by a hole immediately under the plexus choroides, are feparated laterally by a very fine medullary partition, called *feptum lucidum*, from its thinnefs and tranfparency. The lower edge of this feptum is fixed to the fornix, which is a kind of medullary arch (as its name implies) fituated under the corpus callofum, and nearly of a triangular fhape. Anteriorly the fornix fends off two medullary chords, called its *anterior crura;* which feem to be united to each other by a portion of medullary fubftance, named *commiffura anterior cerebri*. Thefe crura diverging from one another, are loft at the outer fide of the lower and fore-part of the third ventricle. Pofteriorly the fornix is formed into two other crura, which unite with two medullary protuberances called *pedes hippocampi*, and fometimes *cornua ammonis*, that extend along the back-part of the lateral ventricles. The concave edge of the pedes hippocampi is covered by a medullary lamina, called *corpus fimbriatum*.

Neither the edges of the fornix, nor its pofterior crura, can be well diftinguifhed, till we have removed the plexus choroides. This is a production of the pia mater, which is fpread over the lateral ventricles. Its loofe

Of the Brain and Nerves.

loofe edges are collected, fo as to appear like a vafcular band on each fide.

When we have removed this plexus, we difcover feveral other protuberances included in the lateral ventricles. Thefe are the corpora ftriata, the thalami nervorum opticorum, the tubercula quadrugemina, and the pineal gland.

The *corpora ftriata* are two curved oblong eminences, that extend along the anterior part of the lateral ventricles. They derive their name from their ftriated appearance, which is owing to an intermixture of the cortical and medullary fubftances of the brain. The *thalami nervorum opticorum*, are fo called, becaufe the optic nerves arife chiefly from them, and they are likewife compofed both of the cortex and medulla. They are feparated from the corpora ftriata only by a kind of medullary chord, the geminum centrum femi-circulare. The thalami are nearly of an oval fhape, and are fituated at the bottom of the upper cavity of the lateral ventricles. They are clofely united, and at their convex part feem to become one body.

Anteriorly, in the fpace between the thalami, we obferve an orifice by which the lateral ventricles communicate, and another leads down from this, under the different appellations of *foramen commune anterius*, *vulva*, *iter ad infundibulum*, but more properly *iter ad tertium ventriculum*; and the feparation of the thalami from each other pofteriorly, forms another opening or interftice called *anus*. This has been fuppofed to communicate with the third ventricle; but it does not, the bottom of it being fhut up by the pia mater. The back-part of the anus is formed by a kind of medullary band, which connects the thalami to each other, and is called *commiffura pofterior cerebri*.

Behind the thalami and commiffura pofterior, we obferve a fmall, foft, greyifh, and oval body, about the fize of a pea. This is the glandula pinealis; it is defcribed by Galen under the name of *conarion*, and has been rendered famous by Defcartes, who fuppofed it to be the feat of the foul. Galen feems formerly to have entertained the fame opinion. Some modern writers have, with as little reafon, imagined that the foul is placed in the corpus callofum.

The pineal gland refts upon four remarkable eminences, difpofed in pairs, and feated immediately below it. Thefe tubercles, which by the ancients were called *teftes* and *nates*, have, fince the time of Winflow, been more commonly named *tubercula quadrugemina*.

Under the thalami we obferve another cavity, the third ventricle, which terminates anteriorly in a fmall medullary canal, the infundibulum, that leads to the glandula pituitaria. It has been doubted, whether the infundibulum is really hollow; but fome late experiments on this part of the brain * by Profeffor Murray of Upfal, clearly prove it to be a medullary canal, furrounded by both laminæ of the pia mater. After freezing the brain, this channel was found filled with ice; and de Haen tells † us, he found it dilated, and filled with a calcareous matter (N).

* *Difp. de Infundibulo Cerebri.*

† *Ratio Med.* tom. vi. p. 271.

The foft fpongy body in which the infundibulum terminates, was by the ancients fuppofed to be of a glandular ftructure, and deftined to filter the ferofity of the brain. Spigelius pretended to have difcovered its excretory duct, but it feems certain that no fuch duct exifts. It is of an oblong fhape, compofed, as it were, of two lobes. In ruminant animals it is much larger than in man.

From the pofterior part of the third ventricle, we fee a fmall groove or channel, defcending obliquely backwards. This channel, which is called the *aqueduct of Sylvius*, though it was known to the ancients, opens into another cavity of the brain, placed between the cerebellum and medulla oblongata, and called the *fourth ventricle*.

133 Cerebellum.

The *cerebellum*, which is divided into two lobes, is commonly fuppofed to be of a firmer texture than the cerebrum; but the truth is, that in the greater number of fubjects, there appears to be no fenfible difference in the confiftence of thefe two parts. It has more of the cortical than of the medullary fubftance in its compofition.

The furrow that divides the two lobes of the cerebellum leads anteriorly to a procefs, compofed of medullary and cortical fubftances, covered by the pia mater; and which, from its being divided into numerous furrows, refembling the rings of the earth-worm, is named *proceffus vermiformis*. This procefs forms a kind of ring in its courfe between the lobes.

The furface of the cerebellum does not afford thofe circumvolutions which appear in the cerebrum; but inftead of thefe, we obferve a great number of minute furrows, running parallel to each other, and nearly in a tranfverfe direction. The pia mater infinuates itfelf into thefe furrows.

When we cut into the fubftance of the cerebellum, from above downwards, we find the medullary part running in a kind of ramifying courfe, and exhibiting an appearance that has gotten the name of *arbor vitæ*. Thefe ramifications unite to form a medullary trunk; the middle, anterior, and moft confiderable part of which forms two proceffes, the crura cerebelli, which unite with the crura cerebri, to form the medulla oblongata. The reft furnifhes two other proceffes, which lofe themfelves under the nates, and thus unite the lobes of the cerebellum to the pofterior part of the cerebrum. Under the nates we obferve a tranfverfe medullary line, or linea alba, running from one of thefe proceffes to the other; and between them we find a very thin medullary lamina, covered with the pia mater, which the generality of anatomifts have (though feemingly without reafon) confidered as a valve formed for clofing the communication between the fourth ventricle and the aquæductus Sylvii. Vieuffens named it *valvula major cerebri*.

134 Medulla oblongata.

The *medulla oblongata* is fituated in the middle, lower, and pofterior part of the cranium, and may be confidered as a production or continuation of the whole medullary fubftance of the cerebrum and cerebellum, being formed by the union of two confiderable medullary proceffes of the cerebrum, called *crura cerebri*,

(N) The under part of it, however, appears to be impervious; at leaft no injection that can be depended on has been made to pafs from it into the glandula pituitaria without laceration of parts.

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bri, with two other ſmaller ones from the cerebellum, which were juſt now ſpoken of under the name of *crura cerebelli*.

The crura cerebri ariſe from the middle and lower part of each hemiſphere. They are ſeparated from each other at their origin, but are united below, where they terminate in a middle protuberance, the *pons Varolii*, ſo called, becauſe Varolius compared it to a bridge. This name, however, can convey no idea of its real appearance. It is, in fact, nothing more than a medullary protuberance, nearly of a ſemi-ſpherical ſhape, which unites the crura cerebri to thoſe of the cerebellum.

Between the crura cerebri, and near the anterior edge of the pons Varolii, are two tubercles, compoſed externally of medullary, and internally of cineritious, ſubſtance, to which Euſtachius firſt gave the name of *eminentiæ mamillares*.

Along the middle of the poſterior ſurface of the medulla oblongata, where it forms the anterior part of the fourth ventricle, we obſerve a kind of furrow which runs downwards and terminates in a point. About an inch above the lower extremity of this fiſſure, ſeveral medullary filaments are to be ſeen running towards it on each ſide in an oblique direction, ſo as to give it the appearance of a writing-pen; hence it is called *calamus ſcriptorius*.

From the poſterior part of the pons Varolii, the medulla oblongata deſcends obliquely backwards; at its fore-part, immediately behind the pons Varolii, we obſerve two pair of eminences, which were deſcribed by Euſtachius, but received no particular appellation till the time of Vieuſſens, who gave them the names of *corpora olivaria* and *corpora pyramidalia*. The former are the outermoſt, being placed one on each ſide. They are nearly of an oval ſhape, and are compoſed of medulla, with ſtreaks of cortical ſubſtance. Between theſe are the corpora pyramidalia, each of which terminates in a point. In the human ſubject theſe four eminences are ſometimes not eaſily diſtinguiſhed.

135 Medulla ſpinalis.

The *medulla ſpinalis*, or *ſpinal marrow*, which is the name given to the medullary chord that is extended down the vertebral canal, from the great foramen of the occipital bone to the bottom of the laſt lumbar vertebra, is a continuation of the medulla oblongata. Like the other parts of the brain, it is inveſted by the dura and pia mater. The firſt of theſe, in its paſſage out of the cranium, adheres to the foramen of the os occipitis. Its connection with the ligamentary ſubſtance that lines the cavity of the ſpine, is only by means of cellular membrane; but between the ſeveral vertebræ, where the nerves paſs out of the ſpine, it ſends off prolongations, which adhere ſtrongly to the vertebral ligaments. Here, as in the cranium, the dura mater has its ſinuſes or large veins. Theſe are two in number, and are ſeen running on each ſide of the medullary column, from the foramen magnum of the os occipitis to the lower part of the os ſacrum. They communicate together by ramifying branches at each vertebra, and terminate in the vertebral, intercoſtal, and ſacral veins.

The pia mater is connected with the dura mater by means of a thin tranſparent ſubſtance, which from its indentations between the ſpinal nerves has obtained the name of *ligamentum denticulatum*. It is ſomewhat firmer than the tunica arochnoidea, but in other reſpects reſembles that membrane. Its uſe is to ſupport the ſpinal marrow, that it may not affect the medulla oblongata by its weight.

The ſpinal marrow itſelf is externally of a white colour; but upon cutting into it we find its middle-part compoſed of a darker coloured maſs, reſembling the cortex of the brain. When the marrow has reached the firſt lumbar vertebra, it becomes extremely narrow, and at length terminates in an oblong protuberance; from the extremity of which the pia mater ſends off a prolongation or ligament, reſembling a nerve, that perforates the dura mater, and is fixed to the os coccygis.

The medulla ſpinalis gives riſe to 30 or 31 pair of nerves, but they are not all of the ſame ſize, nor do they all run in the ſame direction. The upper ones are thinner than the reſt, and are placed almoſt tranſverſely: as we deſcend we find them running more and more obliquely downwards, till at length their courſe is almoſt perpendicular, ſo that the lowermoſt nerves exhibit an appearance that is called *cauda equina*, from its reſemblance to a horſe's tail.

The arteries that ramify through the different parts of the brain, are derived from the internal carotid and from the vertebral arteries. The medulla ſpinalis is ſupplied by the anterior and poſterior ſpinal arteries, and likewiſe receives branches from the cervical, the inferior and ſuperior intercoſtal, the lumbar, and the ſacral arteries.

Sect. II. *Of the Nerves.*

The nerves are medullary chords, differing from each other in ſize, colour, and conſiſtence, and deriving their origin from the medulla oblongata and medulla ſpinalis. There are 39, and ſometimes 40, pair of theſe nerves; nine (o) of which originate from the medulla oblongata, and 30 or 31 from the medulla ſpinalis. They appear to be perfectly inelaſtic, and likewiſe to poſſeſs no irritability. If we irritate muſcular fibres, they immediately contract; but nothing of this ſort happens if we irritate a nerve. They carry with them a covering from the pia mater; but derive no tunic from the dura mater, as hath been generally, tho' erroneouſly, ſuppoſed, ever ſince the time of Galen (p), the 136

5

(o) It has been uſual to deſcribe ten pair of nerves as ariſing from the medulla oblongata; but as the tenth pair ariſe in the ſame manner as the other ſpinal nerves, Santorini, Heiſter, Haller, and others, ſeem very properly to have claſſed them among the nerves of the ſpine.

(p) Baron Haller and Profeſſor Zinn ſeem to have been the firſt who demonſtrated, that the dura mater is reflected upon and adheres to the perioſteum at the edges of the foramina that afford a paſſage to the nerves out of the cranium and vertebral canal, or is ſoon loſt in the cellular ſubſtance.

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the outer covering of the nerves being in fact nothing more than cellular membrane. This covering is very thick where the nerve is exposed to the action of muscles; but where it runs through a bony canal, or is secure from pressure, the cellular tunic is extremely thin, or altogether wanting. We have instances of this in the portio mollis of the auditory nerve, and in the nerves of the heart.

By elevating, carefully and gently, the brain from the basis of the cranium, we find the first nine pair arising in the following order: 1. The nervi olfactorii, distributed through the pituitary membrane, which constitutes the organ of smell. 2. The optici, which go to the eyes, where they receive the impressions of visible objects. 3. The oculorum motores, so called because they are distributed to the muscles of the eye. 4. The pathetici, distributed to the superior oblique muscles of the eyes, the motion of which is expressive of certain passions of the soul. 5. The nerves of this pair soon divide into three principal branches, and each of these has a different name. Its upper division is the opthalamicus, which is distributed to various parts of the eyes, eye-lids, fore-head, nose, and integuments of the face. The second is called the *maxillaris superior*, and the third *maxillaris inferior*; both which names allude to their distribution. 6. The abductores; each of these nerves is distributed to the abductor muscle of the eye, so called, because it helps to draw the globe of the eye from the nose. 7. The auditorii (Q), which are distributed through the organs of hearing. 8. The par vagum, which derives its name from the great number of parts, to which it gives branches both in the thorax and abdomen. 9. The linguales, or hypoglossi, which are distributed to the tongue, and appear to contribute both to the organ of taste and to the motions of the tongue (R).

It has already been observed, that the spinal marrow sends off 30 or 31 pair of nerves; these are chiefly distributed to the exterior parts of the trunk and to the extremities. They are commonly distinguished into the *cervical*, *dorsal*, *lumbar*, and *sacral nerves*. The cervical, which pass out from between the several vertebræ of the neck, are eight (S) in number; the dorsal, twelve; the lumbar, five; and the sacral, five or six; the number of the latter depending on the number of holes in the os sacrum. Each spinal nerve at its origin is composed of two fasciculi of medullary fibres. One of these fasciculi arises from the anterior, and the other from the posterior, surface of the medulla. These fasciculi are separated by the ligamentum denticulatum; after which we find them contiguous to one another. They then perforate the dura mater, and unite to form a considerable knot or ganglion. Each of these ganglions sends off two branches; one anterior, and the other posterior. The anterior branches communicate with each other at their coming out of the spine, and likewise send off one, and sometimes more branches, to assist in the formation of the intercostal nerve.

The knots or ganglions of the nerves just now spoken of, are not only to be met with at their exit from the spine, but likewise in various parts of the body. They occur in the nerves of the medulla oblongata, as well as in those of the spine. They are not the effects of disease, but are to be met with in the same parts of the same nerves, both in the fœtus and adult. They are commonly of an oblong shape, and of a greyish colour, somewhat inclined to red, which is perhaps owing to their being extremely vascular. Internally we are able to distinguish something like an intermixture of the nervous filaments.

Some writers have considered them as so many little brains; Lancisi fancied he had discovered muscular fibres in them, but they are certainly not of an irritable nature. A late writer, Dr Johnstone *, imagines they are intended to deprive us of the power of the will over certain parts, as the heart, for instance: but if this hypothesis were well founded, we should meet with them only in nerves leading to involuntary muscles; whereas it is certain, that the voluntary muscles receive their nerves through ganglions. Doctor Monro, from observing the accurate intermixture of the minute nerves which compose them, considers them as new sources of nervous energy †.

* *Essay on the Use of the Ganglions of the Nerves.*

† *Observations on the Nervous System.*

The nerves, like the blood-vessels, in their course through the body, communicate with each other; and each of these communications constitutes what is called a *plexus*, from whence branches are again detached to different parts of the body. Some of these are constant

(Q) This pair, soon after its entrance into the meatus auditorius internus, separates into two branches. One of these is of a very soft and pulpy consistence, is called the *portio mollis* of the seventh pair, and is spread over the inner part of the ear. The other passes out through the aqueduct of Fallopius in a firm chord, which is distinguished as the portio dura, and is distributed to the external ear and other parts of the neck and face.

(R) Heister has summed up the uses of these nine pair of nerves in the two following Latin verses:

"*Olfaciens, cernens, oculosque movens, patiensque,*
"*Gustans, abducens, audiensque, vagansque, loquensque.*"

(S) Besides these, there is another pair called *accessorii*, which arises from the medulla spinalis at its beginning; and ascending through the great foramen of the os occipitis into the cranium, passes out again close to the eighth pair, with which, however, it does not unite; and it is afterwards distributed chiefly to the muscles of the neck, back, and scapula. In this course it sends off filaments to different parts, and likewise communicates with several other nerves. Physiologists are at a loss how to account for the singular origin and course of these nervi accessorii. The ancients considered them as branches of the eighth pair, distributed to muscles of the scapula: Willis likewise considered them as appendages to that pair, and on that account named them *accessorii*. They are sometimes called the *spinal* pair; but as this latter name is applicable to all the nerves of the spine indiscriminately, it seems better to adopt that given by Willis.

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ſtant and conſiderable enough to be diſtinguiſhed by particular names, as the *ſemilunar plexus*; the *pulmonary plexus*; the *hepatic*, the *cardiac*, &c.

It would be foreign to the purpoſe of this work, to follow the nerves through all their diſtributions; but it may be remembered, that in deſcribing the different viſcera, mention was made of the nerves diſtributed to them. There is one pair, however, called the *intercoſtal*, or *great ſympathetic nerve*, which ſeems to require particular notice, becauſe it has an almoſt univerſal connection and correſpondence with all the other nerves of the body. Authors are not perfectly agreed about the origin of the intercoſtal; but it may perhaps not improperly be deſcribed, as beginning from filaments of the fifth and ſixth pair; it then paſſes out of the cranium, through the bony canal of the carotid, from whence it deſcends laterally cloſe to the bodies of the vertebræ, and receives branches from almoſt all the vertebral nerves; forming almoſt as many ganglions in its courſe through the thorax and abdomen. It ſends off an infinite number of branches to the viſcera in thoſe cavities, and forms ſeveral plexus with the branches of the eighth pair or par vagum.

That the nerves are deſtined to convey the principles of motion and ſenſibility to the brain from all parts of the ſyſtem, there can be no doubt; but how theſe effects are produced, no one has ever yet been able to determine. The inquiry has been a conſtant ſource of hypotheſis in all ages, and has produced ſome ingenious ideas, and many erroneous poſitions, but without having hitherto afforded much ſatisfactory information.

Some phyſiologiſts have conſidered a trunk of nerves as a ſolid chord, capable of being divided into an infinite number of filaments, by means of which the impreſſions of feeling are conveyed to the ſenſorium commune. Others have ſuppoſed it to be a canal, which afterwards ſeparates into more minute channels; or, perhaps, as being an aſſemblage of many very ſmall and diſtinct tubes, connected to each other, and thus forming a cylindrical chord. They who contend for their being ſolid bodies, are of opinion, that feeling is occaſioned by vibration; ſo that, for inſtance, according to this ſyſtem, by pricking the finger, a vibration would be occaſioned in the nerve, diſtributed through its ſubſtance; and the effects of this vibration, when extended to the ſenſorium, would be an excital of pain. But the inelaſticity, the ſoftneſs, the connection, and the ſituation of the nerves, are ſo many proofs that vibration has no ſhare in the cauſe of feeling.

Others have ſuppoſed, that in the brain and ſpinal marrow, a very ſubtile fluid is ſecreted, and from thence conveyed through the imperceptible tubes, which they conſider as exiſting in the nerves. They have farther ſuppoſed, that this very ſubtile fluid, to which they have given the name of *animal ſpirits*, is ſecreted in the cortical ſubſtance of the brain and ſpinal marrow, from whence it paſſes through the medullary ſubſtance. This, like the other ſyſtem, is founded altogether on hypotheſis; but it ſeems to be an hypotheſis derived from much more probable principles, and there are many ingenious arguments to be brought in its ſupport.

EXPLANATION OF PLATE XXIV.

FIG. I. Repreſents the Inferior part of the Brain;—the Anterior part of the whole Spine, including the Medulla Spinalis;—with the origin and large portions of all the NERVES.

A A, The anterior lobes of the cerebrum. B B, The lateral lobes of the cerebrum. C C, The two lobes of the cerebellum. D, Tuber annulare. E, The paſſage from the third ventricle to the infundibulum. F, The medulla oblongata, which ſends off the medulla ſpinalis through the ſpine. G G, That part of the os occipitis which is placed above (H H) the tranſverſe proceſſes of the firſt cervical vertebra. I I, &c. The ſeven cervical vertebræ, with their intermediate cartilages. K K, &c. The twelve dorſal vertebræ, with their intermediate cartilages. L L, &c. The five lumbar vertebræ, with their intermediate cartilages. M, The os ſacrum. N, The os coccygis.

NERVES.—1 1, The firſt pair of nerves, named *olfactory*, which go to the noſe. 2 2, The ſecond pair, named *optic*, which goes to form the tunica retina of the eye. 3 3, The third pair, named *motor oculi*; it ſupplies moſt of the muſcles of the eye-ball. 4 4, The fourth pair, named *pathetic*,—which is wholly ſpent upon the muſculus trochlearis of the eye. 5 5, The fifth pair divides into three branches.—The firſt, named *opthalmic*, goes to the orbit, ſupplies the lachrymal gland, and ſends branches out to the forehead and noſe.—The ſecond, named *ſuperior maxillary*, ſupplies the teeth of the upper jaw, and ſome of the muſcles of the lips.—The third, named *inferior maxillary*, is ſpent upon the muſcles and teeth of the lower jaw, tongue, and muſcles of the lips. 6 6, The ſixth pair, which, after ſending off the beginning of the intercoſtal or great ſympathetic, is ſpent upon the abductor oculi. 7 7, The ſeventh pair, named *auditory*, divides into two branches.—The largeſt, named *portio mollis*, is ſpent upon the internal ear.—The ſmalleſt, *portio dura*, joins to the fifth pair within the internal ear by a reflected branch from the ſecond of the fifth; and within the tympanum, by a branch from the third of the fifth, named *chorda tympani*.—Vid. fig. 3. near B. 8 8, &c. The eighth pair, named *par vagum*,—which accompanies the intercoſtal, and is ſpent upon the tongue, larynx, pharynx, lungs, and abdominal viſcera. 9 9, The ninth pair, which are ſpent upon the tongue. 10 10, &c. The intercoſtal, or great ſympathetic, which is ſeen from the ſixth pair to the bottom of the pelvis on each ſide of the ſpine, and joining with all the nerves of the ſpine;—in its progreſs ſupplying the heart, and, with the par vagum, the contents of the abdomen and pelvis. 11 11, The acceſſorius, which is ſpent upon the ſternocleido-maſtoidæus and trapezius muſcles. 12 12, The firſt cervical nerves;—13 13, The ſecond cervical nerves;—both ſpent upon the muſcles that lie on the neck, and teguments of the neck and head. 14 14, The third cervical nerves, which, after ſending off (15 15, &c.) the phrenic nerves to the diaphragm, ſupply

fupply the mufcles and teguments that lie on the fide of the neck and top of the fhoulder. 16 16, The brachial plexus, formed by the fourth, fifth, fixth, feventh cervicals, and firft dorfal nerves,—which fupply the mufcles and teguments of the fuperior extremity. 17 17, The twelve dorfal, or proper intercoftal nerves, which are fpent upon the intercoftal mufcles and fome of the large mufcles which lie upon the thorax. 18 18, The five lumbar pairs of nerves, which fupply the lumbar and abdominal mufclcs, and fome of the teguments and mufcles of the inferior extremity. 19 19, The facro-fciatic, or pofterior crural nerve, formed by the two inferior lumbar, and three fuperior of the os facrum. This large nerve fupplies the greateft part of the mufcles and teguments of the inferior extremity. 20, The ftomachic plexus, formed by the eighth pair. 21 21, Branches of the folar or cæliac plexus, formed by the eighth pair and intercoftals, which fupply the ftomach and chylopoietic vifcera. 22 22, Branches of the fuperior and inferior mefenteric plexufes, formed by the eighth pair and intercoftals, which fupply the chylopoietic vifcera, with part of the organs of urine and generation. 23 23, Nerves which accompany the fpermatic cord. 24 24, The hypogaftric plexus, which fupplies the organs of urine and generation within the pelvis.

Fig. 2, 3, 4, 5. Show different Views of the Inferior part of the Brain, cut perpendicularly through the Middle,—with the Origin and large Portions of all the Nerves which pafs out through the Bones of the Cranium,—and the three firft Cervicals.

A, The anterior lobe. B, The lateral lobe of the cerebrum. C, One of the lobes of the cerebellum. D, Tuber annulare. E, Corpus pyramidale, in the middle of the medulla oblongata. F, The corpus olivare, in the fide of the medulla oblongata. G, The medulla oblongata. H, The medulla fpinalis.

Nerves.—1 2 3 4 5 6 7 8 and 9, Pairs of nerves. 10 10, Nervus acceffforius, which comes from—11, 12, and 13, the three firft cervical nerves.

PART VI. Of the SENSES, and their ORGANS.

137. IN treating of the fenfes, we mean to confine ourfelves to the external ones of *touch*, *tafte*, *fmelling*, *hearing*, and *vifion*. The word *fenfe*, when applied to thefe five, feems to imply not only the fenfation excited in the mind by certain impreffions made on the body, but likewife the organ deftined to receive and tranfmit thefe impreffions to the fenforium. Each of thefe organs being of a peculiar ftructure, is fufceptible only of particular impreffions, which will be pointed out as we proceed to defcribe each of them feparately.

Sect. I. *Of Touch.*

138. The fenfe of touch may be defined to be the faculty of diftinguifhing certain properties of bodies by the feel. In a general acceptation, this definition might perhaps not improperly be extended to every part of the body poffeffed of fenfibility (T), but it is commonly confined to the nervous papillæ of the cutis, or true fkin, which, with its appendages, and their feveral ufes, have been already defcribed.

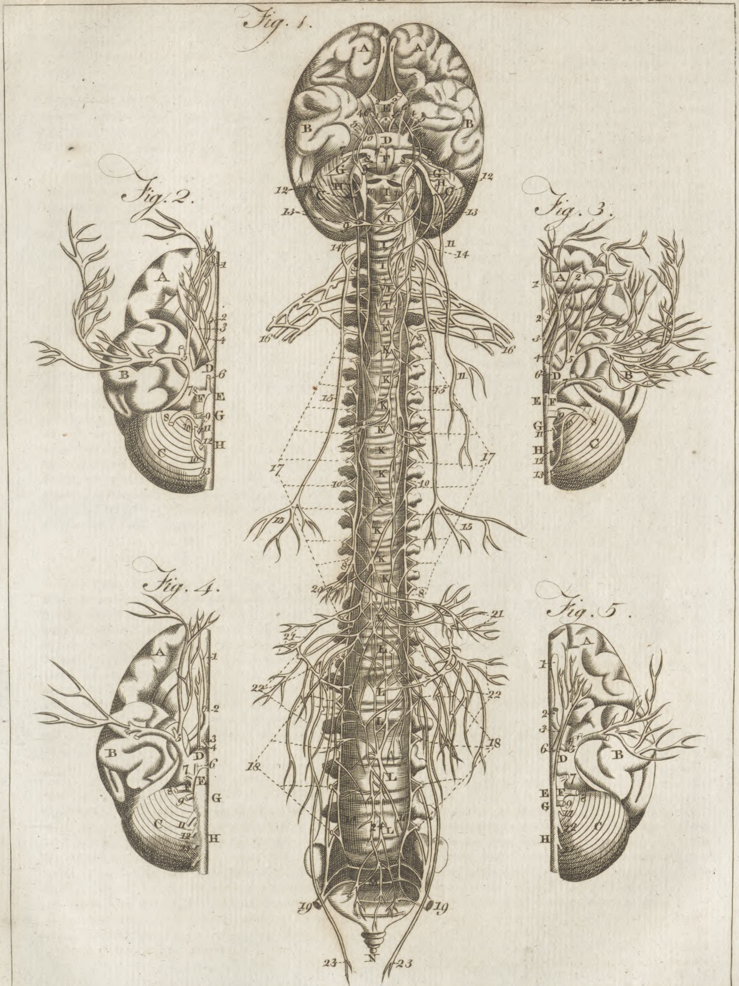
The exterior properties of bodies, fuch as their folidity, moifture, inequality, fmoothnefs, drynefs, or fluidity, and likewife their degree of heat, feem all to be capable of making different impreffions on the papillæ, and confequently of exciting different ideas in the fenforium commune. But the organ of touch, like all the other fenfes, is not equally delicate in every part of the body, or in every fubject; being in fome much more exquifite than it is in others.

Sect. II. *Of the Tafte.*

The fenfe of tafte is feated chiefly in the tongue; 139.
the fituation and figure of which are fufficiently known.

On the upper furface of this organ we may obferve a great number of papillæ, which, on account of their difference in fize and fhape, are commonly divided into three claffes. The largeft are fituated towards the bafis of the tongue. Their number commonly varies from feven to nine, and they feem to be mucous follicles. Thofe of the fecond clafs are fomewhat fmaller, and of a cylindrical fhape. They are moft numerous about the middle of the tongue. Thofe of the third clafs are very minute, and of a conical fhape. They are

(T) In the courfe of this article, mention has often been made of the fenfibility or infenfibility of different parts of the body: it will therefore, perhaps, not be amifs to obferve in this place, that many parts which were formerly fuppofed to poffefs the moft exquifite fenfe, are now known to have but little or no feeling, at leaft in a found ftate; for in an inflamed ftate, even the bones, the moft infenfible parts of any, become fufceptible of the moft painful fenfations. This curious difcovery is due to the late Baron Haller. His experiments prove, that the bones, cartilages, ligaments, tendons, epidermis, and membranes, (as the pleura, pericardium, dura and pia mater, periofteum, &c.), may in a healthy ftate be confidered as infenfible. As fenfibility depends on the brain and nerves, of courfe different parts will poffefs a greater or lefs degree of feeling, in proportion as they are fupplied with a greater or fmaller number of nerves. Upon this principle it is, that the fkin, mufcles, ftomach, inteftines, urinary bladder, ureters, uterus, vagina, penis, tongue, and retina, are extremely fenfible, while the lungs and glands have only an obfcure degree of feeling.



A. Bell Sculp.

Of the Senſes.

are very numerous on the apex and edges of the tongue, and have been ſuppoſed to be formed by the extremities of its nerves.

We obſerve a line, the *linea linguæ mediana*, running along the middle of the tongue, and dividing it as it were into two portions. Towards the baſis of the tongue, we meet with a little cavity, named by Morgagni *foramen cæcum*, which ſeems to be nothing more than a common termination of ſome of the excretory ducts of mucous glands ſituated within the ſubſtance of the tongue.

We have already obſerved, that this organ is every where covered by the cuticle, which, by forming a reduplication, called the *frænum*, at its under part, ſerves to prevent the too great motion of the tongue, and to fix it in its ſituation. But, beſides this attachment, the tongue is connected by means of its muſcles and membranous ligaments, to the lower jaw, the os hyoides, and the ſtyloid proceſſes.

The principal arteries of the tongue are the linguales, which ariſe from the external carotid. Its veins empty themſelves into the external jugulars. Its nerves ariſe from the fifth, eighth, and ninth, pair.

The variety of taſtes ſeems to be occaſioned by the different impreſſions made on the papillæ by the food. The different ſtate of the papillæ with reſpect to their moiſture, their figure, or their covering, ſeems to produce a conſiderable difference in the taſte, not only in different people, but in the ſame ſubject, in ſickneſs and in health. The great uſe of the taſte ſeems to be to enable us to diſtinguiſh wholeſome and ſalutary food from that which is unhealthy; and we obſerve that many quadrupeds, by having their papillæ (U) very large and long, have the faculty of diſtinguiſhing flavours with infinite accuracy.

Sect. III. *Of Smelling.*

140. The ſenſe of ſmelling, like the ſenſe of taſte, ſeems intended to direct us to a proper choice of aliment, and is chiefly ſeated in the noſe, which is diſtinguiſhed into its external and internal parts. The ſituation and figure of the former of theſe do not ſeem to require a definition. It is compoſed of bones and cartilages, covered by muſcular fibres and by the common integuments. The bones make up the upper portion, and the cartilages the lower one. The ſeptum narium, like the noſe, is likewiſe in part bony, and in part cartilaginous. Theſe bones and their connections were deſcribed in the oſteology.

The internal part of the noſe, beſides the oſſa ſpongioſa, has ſix cavities or ſinuſes, the maxillary, the frontal, and the ſphenoid, which were all deſcribed with the bones of the head. They all open into the noſtrils; and the noſe likewiſe communicates with the mouth, larynx, and pharynx, poſteriorly behind the velum palati.

All theſe ſeveral parts, which are included in the internal diviſion of the noſe, viz. the inner ſurface of the noſtrils, the lamellæ of the oſſa ſpongioſa, and the ſinuſes, are lined by a thick and very vaſcular membrane, which, though not unknown to the ancients, was firſt well deſcribed by Schneider *, and is therefore now commonly named *membrana pituitaria Schneideri*. This membrane is truly the organ of ſmelling; but its real ſtructure does not yet ſeem to be perfectly underſtood. It appears to be a continuation of the cuticle, which lines the inner ſurface of the mouth. In ſome parts of the noſe it is ſmooth and firm, and in others it is looſe and ſpongy. It is conſtantly moiſtened by a mucous ſecretion; the finer parts of which are carried off by the air we breathe, and the remainder, by being retained in the ſinuſes, acquires conſiderable conſiſtence. The manner in which this mucus is ſecreted has not yet been ſatisfactorily aſcertained; but it ſeems to be by means of mucous follicles.

* *De Catarrho*, lib. iii.

Its arteries are branches of the internal maxillary and internal carotid. Its veins empty themſelves into the internal jugulars. The firſt pair of nerves, the olfactory, are ſpread over every part of it, and it likewiſe receives branches from the fifth pair.

After what has been ſaid of the pituitary membrane, it will not be difficult to conceive how the air we draw in at the noſtrils, being impregnated with the effluvia of bodies, excites in us that kind of ſenſation we call *ſmelling*. As theſe effluvia, from their being exceedingly light and volatile, cannot be capable in a ſmall quantity of making any great impreſſion on the extremities of the olfactory nerves, it was neceſſary to give conſiderable extent to the pituitary membrane, that by this means a greater number of odoriferous particles might be admitted at the ſame time. When we wiſh to take in much of the effluvia of any thing, we naturally cloſe the mouth, that all the air we inſpire may paſs through the noſtrils; and at the ſame time, by means of the muſcles of the noſe, the noſtrils are dilated, and a greater quantity of air is drawn into them.

In many quadrupeds, the ſenſe of ſmelling is much more extenſive and delicate than it is in the human ſubject; and in the human ſubject it ſeems to be more perfect the leſs it is vitiated by a variety of ſmells. It is not always in the ſame ſtate of perfection, being naturally affected by every change of the pituitary membrane, and of the lymph with which that membrane is moiſtened.

Sect. IV. *Of Hearing.*

Before we undertake to explain the manner in which we are enabled to receive the impreſſions of ſound, it will be neceſſary to deſcribe the *ear*, which is the *organ of hearing*. It is commonly diſtinguiſhed into external and internal. The former of theſe diviſions includes all that we are able to diſcover without diſſection, and the meatus auditorius, as far as the tympanum; and the latter, all the other parts of the ear. 141.

The *external ear* is a cartilaginous funnel, covered by the common integuments, and attached, by means of its ligaments and muſcles, to the temporal bone. Although capable only of a very obſcure motion, it is found

(U) Malpighi's deſcription of the papillæ, which has been copied by many anatomical writers, ſeems to have been taken chiefly from the tongues of ſheep.

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found to have several muscles. Different parts of it are distinguished by different names; all its cartilaginous part is called *ala* or *wing*, to distinguish it from the soft and pendent part below, called the *lobe*. Its outer circle or border is called *helix*, and the semicircle within this, *antihelix*. The moveable cartilage placed immediately before the meatus auditorius, which it may be made to close exactly, is named *tragus;* and an eminence opposite to this at the extremity of the antihelix, is called *antitragus*. The concha is a considerable cavity formed by the extremities of the helix and antihelix. The meatus auditorius, which at its opening is cartilaginous, is lined with a very thin membrane, which is a continuation of the cuticle from the surface of the ear.

In this canal we find a yellow wax, which is secreted by a number of minute glands or follicles, each of which has an excretory duct. This secretion, which is at first of an oily consistence, defends the membrane of the tympanum from the injuries of the air; and by its bitterness, prevents minute insects from entering into the ear. But when from neglect or disease it accumulates in too great a quantity, it sometimes occasions deafness. The inner extremity of the meatus is closed by a very thin transparent membrane, the membrana tympani, which is set in a bony circle like the head of a drum. In the last century Rivinus, professor at Leipsic, fancied he had discovered a hole in this membrane, surrounded by a sphincter, and affording a passage to the air, between the external and internal ear. Cowper, Heister, and some other anatomists, have admitted this supposed foramen, which certainly does not exist. Whenever there is any opening in the membrana tympani, it may be considered as accidental. Under the membrana tympani runs a branch of the fifth pair of nerves, called *chorda tympani;* and beyond this membrane is the cavity of the tympanum, which is about seven or eight lines wide, and half so many in depth; it is semispherical, and every where lined by a very fine membrane. There are four openings to be observed in this cavity. It communicates with the mouth by means of the Eustachian tube. This canal, which is in part bony and in part cartilaginous, begins by a very narrow opening at the anterior and almost superior part of the tympanum, increasing in size as it advances towards the palate of the mouth, where it terminates by an oval opening. This tube is every where lined by the same membrane that covers the inside of the mouth. The real use of this canal does not seem to have been hitherto satisfactorily ascertained; but sound would seem to be conveyed through it to the membrana tympani, deaf persons being often observed to listen attentively with their mouths open. Opposite to this is a minute passage, which leads to the sinuosities of the mastoid process; and the two other openings, which are in the internal process of the os petrosum, are the fenestra ovalis, and fenestra rotunda, both of which are covered by a very fine membrane.

There are three distinct bones in the cavity of the tympanum; and these are the malleus, incus, and stapes. Besides these there is a fourth, which is the *os orbiculare,* considered by some anatomists as a process of the stapes, which is necessarily broken off by the violence we are obliged to use in getting at these bones; but when accurately considered, it seems to be a distinct bone.

The *malleus* is supposed to resemble a hammer, being larger at one extremity, which is its head, than it is at the other, which is its handle. The latter is attached to the membrana tympani, and the head of the bone is articulated with the incus.

The *incus,* as it is called from its shape, though it seems to have less resemblance to an anvil than to one of the dentes molares with its roots widely separated from each other, is distinguished into its body and its legs. One of its legs is placed at the entry of the canal which leads to the mastoid process; and the other, which is somewhat longer, is articulated with the stapes, or rather with the os orbiculare, which is placed between them.

The third bone is very properly named *stapes*, being perfectly shaped like a stirrup. Its basis is fixed into the fenestra ovalis, and its upper part is articulated with the os orbiculare. What is called the *fenestra rotunda,* though perhaps improperly, as it is more oval than round, is observed a little above the other, in an eminence formed by the os petrosum, and is closed by a continuation of the membrane that lines the inner surface of the tympanum. The stapes and malleus are each of them furnished with a little muscle, the stapedeus and tensor tympani. The first of these, which is the smallest in the body, arises from a little cavern in the posterior and upper part of the cavity of the tympanum; and its tendon, after passing through a hole in the same cavern, is inserted at the back part of the head of the stapes. This muscle, by drawing the stapes obliquely upwards, assists in stretching the membrana tympani.

The tensor tympani (x), or internus mallei as it is called by some writers, arises from the cartilaginous extremity of the Eustachian tube, and is inserted into the back part of the handle of the malleus, which it serves to pull inwards, and of course helps to stretch the membrana tympani.

The labyrinth is the only part of the ear which remains to be described. It is situated in the os petrosum, and is separated from the tympanum by a partition which is every where bony, except at the two fenestræ. It is composed of three parts; and these are the vestibulum, the semicircular canals, and the cochlea.

The *vestibulum* is an irregular cavity, much smaller than the tympanum, situated nearly in the centre of the os petrosum, between the tympanum, the cochlea, and the semicircular canals. It is open on the side of the tympanum by means of the fenestra ovalis, and communicates with the upper portion of the cochlea by an oblong foramen, which is under the fenestra ovalis, from which it is separated only by a very thin partition.

Each of the three *semicircular canals* forms about half

(x) Some anatomists describe three muscles of the malleus; but only this one seems to deserve the name of muscle; what are called the *externus* and *obliquus mallei,* seeming to be ligaments rather than muscles.

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half a circle of nearly a line in diameter, and running each in a different direction, they are distinguished into *vertical*, *oblique*, and *horizontal*. These three canals open by both their extremities into the vestibulum; but the vertical and the oblique being united together at one of their extremities, there are only five orifices to be seen in the vestibulum.

The *cochlea* is a canal which takes a spiral course, not unlike the shell of a snail. From its basis to its apex it makes two turns and a half; and is divided into two canals by a very thin lamina or septum, which is in part bony and in part membranous, in such a manner that these two canals only communicate with each other at the point. One of them opens into the vestibulum, and the other is covered by the membrane that closes the fenestra rotunda. The bony lamella which separates the two canals is exceedingly thin, and fills about two thirds of the diameter of the canal. The rest of the septum is composed of a most delicate membrane, which lines the whole inner surface of the cochlea, and seems to form this division in the same manner as the two membranous bags of the pleura, by being applied to each other, form the mediastinum.

Every part of the labyrinth is furnished with a very delicate periosteum, and filled with a watery fluid, secreted as in other cavities. This fluid transmits to the nerves the vibrations it receives from the membrane closing the fenestra rotunda, and from the basis of the stapes, where it rests on the fenestrum ovale. When this fluid is collected in too great a quantity, or is compressed by the stapes, it is supposed to escape through two minute canals or aqueducts, lately described by Dr Cotunni *, an ingenious physician at Naples. One of these aqueducts opens into the bottom of the vestibulum, and the other into the cochlea, near the fenestra rotunda. They both pass through the os petrosum, and communicate with the cavity of the cranium where the fluid that passes through them is absorbed; and they are lined by a membrane which is supposed to be a production of the dura mater.

* *De aquæductibus Auris Humanæ Internæ*, 8vo, 1760.

The arteries of the external ear come from the temporal and other branches of the external carotid, and its veins pass into the jugular. The internal ear receives branches of arteries from the basilary and carotids, and its veins empty themselves into the sinuses of the dura mater, and into the internal jugular.

The portio mollis of the seventh pair is distributed through the cochlea, the vestibulum, and the semicircular canals; and the portio dura sends off a branch to the tympanum, and other branches to the external ear and parts near it.

The *sense of hearing*, in producing which all the parts we have described assist, is occasioned by a certain modulation of the air collected by the funnel-like shape of the external ear, and conveyed through the meatus auditorius to the membrana tympani. That sound is propagated by means of the air, is very easily proved by ringing a bell under the receiver of an air-pump; the sound it affords being found to diminish gradually as the air becomes exhausted, till at length it ceases to be heard at all. Sound moves through the air with infinite velocity; but the degree of its motion seems to depend on the state of the air, as it constantly moves faster in a dense and dry, than it does in a moist and rarefied air. See *Acoustics*, n° 20.

That the air vibrating on the membrana tympani communicates its vibration to the different parts of the labyrinth, and by means of the fluid contained in this cavity affects the auditory nerve so as to produce sound, seems to be very probable; but the situation, the minuteness, and the variety of the parts which compose the ear, do not permit much to be advanced with certainty concerning their mode of action.

Some of these parts seem to constitute the immediate organ of hearing, and these are all the parts of the vestibulum: but there are others which seem intended for the perfection of this sense, without being absolutely essential to it. It has happened, for instance, that the membrana tympani, and the little bones of the ear, have been destroyed by disease, without depriving the patient of the sense of hearing (Y).

Sound is more or less loud in proportion to the strength of the vibration; and the variety of sounds seems to depend on the difference of this vibration; for the more quick and frequent it is, the more acute will be the sound, and *vice versa*.

Before we conclude this article, it will be right to explain certain phenomena, which will be found to have a relation to the organ of hearing.

Every body has, in consequence of particular sounds, occasionally felt that disagreeable sensation which is usually called *setting the teeth on edge*: and the cause of this sensation may be traced to the communication which the portio dura of the auditory nerve has with the branches of the fifth pair that are distributed to the teeth, being probably occasioned by the violent tremor produced in the membrana tympani by these very acute sounds. Upon the same principle we may explain the strong idea of sound which a person has who holds a vibrating string between his teeth.

The humming which is sometimes perceived in the ear, without any exterior cause, may be occasioned either by an increased action of the arteries in the ears, or by convulsive contractions of the muscles of the malleus and stapes, affecting the auditory nerve in such a manner as to produce the idea of sound. An ingenious philosophical writer * has lately discovered, that there are sounds liable to be excited in the ear by irritation, and without any assistance from the vibrations of the air.

* *Elliot's Philosophical Observations on the Senses of Vision and Hearing*, 8vo.

Sect. V. *Of Vision* †.

† See Optics, 142.

The eyes, which constitute the organ of vision, are situated in two bony cavities named *orbits*, where they are surrounded by several parts, which are either intended to protect them from external injury, or to assist in their motion.

The

(Y) This observation has led to a supposition, that a perforation of this membrane may in some cases of deafness be useful; and Mr Cheselden relates, that, some years ago, a malefactor was pardoned on condition that he should submit to this operation; but the public clamour raised against it was so great, that it was thought right not to perform it.

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The globe of the eye is immediately covered by two eye-lids or palpebræ, which are composed of muscular fibres † covered by the common integuments, and lined by a very fine and smooth membrane, which is from thence extended over part of the globe of the eye, and is called *tunica conjunctiva*. Each eye-lid is cartilaginous at its edge; and this border, which is called *tarsus*, is furnished with a row of hairs named *cilia* or *eye-lashes*

The cilia serve to protect the eye from insects and minute bodies floating in the air, and likewise to moderate the action of the rays of light in their passage to the retina. At the roots of these hairs there are sebaceous follicles, first noticed by Meibomius, which discharge a glutinous liniment. Sometimes the fluid they secrete has too much viscidity, and the eye-lids become glued to each other.

The upper border of the orbit is covered by the eye-brows or supercilia, which by means of their two muscles are capable of being brought towards each other, or of being carried upwards. They have been considered as serving to protect the eyes, but they are probably intended more for ornament than utility (z).

The orbits, in which the eyes are placed, are furnished with a good deal of fat, which affords a soft bed on which the eye performs its several motions. The inner angle of each orbit, or that part of it which is near the nose, is called *canthus major*, or the *great angle;* and the outer angle, which is on the opposite side of the eye, is the *canthus minor*, or *little angle*.

The little reddish body which we observe in the great angle of the eye-lids, and which is called *caruncula lachrymalis*, is supposed to be of a glandular structure, and, like the follicles of the eye-lids, to secrete an oily humour. But its structure and use do not seem to have been hitherto accurately determined. The surface of the eye is constantly moistened by a very fine limpid fluid called the *tears*, which is chiefly, and perhaps wholly, derived from a large gland of the conglomerate kind, situated in a small depression of the os frontis near the outer angle of the eye. Its excretory ducts pierce the tunica conjunctiva just above the cartilaginous borders of the upper eye-lids. When the tears were supposed to be secreted by the caruncule, this gland was called *glandula innominata;* but now that its structure and uses are ascertained, it very properly has the name of *glandula lachrymalis*. The tears poured out by the ducts of this gland are, in a natural and healthy state, incessantly spread over the surface of the eye, to keep it clear and transparent, by means of the eye-lids, and as constantly pass out at the opposite corner of the eye or inner angle, through two minute orifices, the puncta lachrymalia (A); being determined into these little openings by a reduplication of the tunica conjunctiva, shaped like a crescent, the two points of which answer to the puncta. This reduplication is named *membrana*, or *valvula semilunaris*. Each of these puncta is the beginning of a small excretory tube, through which the tears pass into a little pouch or reservoir, the sacculus lachrymalis, which lies in an excavation formed partly by the nasal process of the os maxillare superius, and partly by the os unguis. The lower part of this sac forms a duct called the *ductus ad nares*, which is continued through a bony channel, and opens into the nose, through which the tears are occasionally discharged (B).

The motions of the eye are performed by six muscles; four of which are straight and two oblique. The straight muscles are distinguished by the names of *elevator*, *depressor*, *adductor*, and *abductor*, from their several uses in elevating and depressing the eye, drawing it towards the nose, or carrying it from the nose towards the temple. All these four muscles arise from the bottom of the orbit, and are inserted by flat tendons into the globe of the eye. The oblique muscles are intended for the more compound motions of the eye. The first of these muscles, the obliquus superior, does not, like the other four muscles we have described, arise from the bottom of the orbit, but from the edge of the foramen that transmits the optic nerve, which separates the origin of this muscle from that of the others. From this beginning it passes in a straight line towards a very small cartilaginous ring, the situation of which is marked in the skeleton by a little hollow in the internal orbitar process of the os frontis. The tendon of the muscle, after passing through this ring, is inserted into the upper part of the globe of the eye, which it serves to draw forwards, at the same time turning the pupil downwards.

The obliquus inferior arises from the edge of the orbit, under the opening of the ductus lachrymalis; and is inserted somewhat posteriorly into the outer side of the globe, serving to draw the eye forwards and turn the pupil upwards. When either of these two muscles acts separately, the eye is moved on its axis; but when they act together, it is compressed both above and below. The eye itself, which is now to be described, with its tunics, humours, and component parts, is nearly of a spherical figure. Of its tunics, the conjunctiva has been already described as a partial covering, reflected from the inner surface of the eye-lids over the anterior portion of the eye. What has been named *albuginea* cannot properly be considered as a coat of the eye, being in fact nothing more than the tendons of the straight muscles spread over some parts of the sclerotica.

The immediate tunics of the eye, which are to be demonstrated when its partial coverings, and all the other parts with which it is surrounded, are removed, are the sclerotica, cornea, choroides, and retina.

The *sclerotica*, which is the exterior coat, is every where

(z) It is observable, that the eye-brows are peculiar to the human species.

(A) It sometimes happens, that this very pellucid fluid, which moistens the eye, being poured out through the excretory ducts of the lachrymal gland faster than it can be carried off through the puncta, trickles down the cheek, and is then strictly and properly called *tears*.

(B) When the ductus ad nares becomes obstructed in consequence of disease, the tears are no longer able to pass into the nostrils; the sacculus lachrymalis becomes distended; and inflammation, and sometimes ulceration, taking place, constitute the disease called *fistula lachrymalis*.

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where white and opaque, and is joined at its anterior edge to another, which has more convexity than any other part of the globe, and being exceedingly transparent, is called *cornea* (C). These two parts are perfectly different in their structure; so that some anatomists suppose them to be as distinct from each other as the glass of a watch is from the case into which it is fixed. The sclerotica is of a compact fibrous structure; the cornea, on the other hand, is composed of a great number of laminæ united by cellular membrane. By macerating them in boiling water, they do not separate from each other, as some writers have asserted; but the cornea soon softens, and becomes of a glutinous consistence.

The ancients supposed the sclerotica to be a continuation of the dura mater. Morgagni and some other modern writers are of the same opinion; but this point is disputed by Winslow, Haller, Zinn, and others. The truth seems to be, that the sclerotica, though not a production of the dura mater, adheres intimately to that membrane.

The *choroides* is so called because it is furnished with a great number of vessels. It has likewise been named *uvea*, on account of its resemblance to a grape. Many modern anatomical writers have considered it as a production of the pia mater. This was likewise the opinion of the ancients; but the strength and thickness of the choroides, when compared with the delicate structure of the pia mater, are sufficient proofs of their being two distinct membranes.

The choroides has of late generally been described as consisting of two laminæ; the innermost of which has been named after Ruysch, who first described it. It is certain, however, that Ruysch's distinction is ill founded, at least with respect to the human eye, in which we are unable to demonstrate any such structure, although the tunica choroides of sheep and some other quadrupeds may easily be separated into two layers.

The choroides adheres intimately to the sclerotica round the edge of the cornea; and at the place of this union we may observe a little whitish areola, named *ligamentum ciliare*, though it is not of a ligamentous nature.

They who suppose the choroides to be composed of two laminæ, describe the external one as terminating in the ligamentum ciliare, and the internal one as extending farther to form the iris, which is the circle we are able to distinguish through the cornea: but this part is of a very different structure from the choroides; so that some late writers have perhaps not improperly considered the iris as a distinct membrane. It derives its name from the variety of its colours, and is perforated in its middle. This perforation, which is called the *pupil* or *sight* of the eye, is closed in the fœtus by a very thin vascular membrane. This membrana pupillaris commonly disappears about the seventh month.

On the under side of the iris we observe many minute fibres, called *ciliary processes*, which pass in radii or parallel lines from the circumference to the centre. The contraction and dilatation of the pupil are supposed to depend on the action of these processes. Some have considered them as muscular, but they are not of an irritable nature; others have supposed them to be filaments of nerves: but their real structure has never yet been clearly ascertained.

Besides these ciliary processes, anatomists usually speak of the circular fibres of the iris, but no such seem to exist.

The posterior surface of the iris, the ciliary processes, and part of the tunica choroides, are covered by a black mucus for the purposes of accurate and distinct vision; but the manner in which it is secreted, has not been determined.

Immediately under the tunica choroides we find the third and inner coat, called the *retina*, which seems to be merely an expansion of the pulpy substance of the optic nerve, extending to the borders of the crystalline humour.

The greatest part of the globe of the eye, within these several tunics, is filled by a very transparent and gelatinous humour of considerable consistence, which, from its supposed resemblance to fused glass, is called the *vitreous humour*. It is invested by a very fine and delicate membrane, called *tunica vitrea*, and sometimes *arachnoides*.—It is supposed to be composed of two laminæ; one of which dips into its substance, and by dividing the humour into cells adds to its firmness. The fore-part of the vitreous humour is a little hollowed, to receive a very white and transparent substance of a firm texture, and of a lenticular and somewhat convex shape, named the *crystalline humour*. It is included in a capsula, which seems to be formed by a separation of the two laminæ of the tunica vitrea.

The fore-part of the eye is filled by a very thin and transparent fluid, named the *aqueous humour*, which occupies all the space between the crystalline and the prominent cornea.—That part of the choroides which is called the *iris*, and which comes forward to form the pupil, appears to be suspended as it were in this humour, and has occasioned this portion of the eye to be distinguished into two parts. One of these, which is the little space between the anterior surface of the crystalline and the iris, is called the *posterior chamber*; and the other, which is the space between the iris and the cornea, is called the *anterior chamber* of the eye (D). Both these spaces are completely filled with the aqueous humour (E).

The eye receives its arteries from the internal carotid

(C) Some writers, who have given the name of *cornea* to all this outer coat, have named what is here and most commonly called *sclerotica*, *cornea opaca*; and its anterior and transparent portion, *cornea lucida*.

(D) I am aware that some anatomists, particularly Lieutaud, are of opinion, that the iris is every where in close contact with the crystalline, and that it is of course right to speak only of one chamber of the eye; but as this does not appear to be the case, the situation of the iris and the two chambers of the eye are here described in the usual way.

(E) When the crystalline becomes opaque, so as to prevent the passage of the rays of light to the retina, it constitutes what is called a *cataract*; and the operation of couching consists in removing the diseased crystalline from

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tid, through the foramina optica; and its veins pass through the foramina lacera, and empty themselves into the lateral sinuses. Some of the ramifications of these vessels appear on the inner surface of the iris, where they are seen to make very minute convolutions, which are sufficiently remarkable to be distinguished by the name of *circulus arteriosus*, though perhaps improperly, as they are chiefly branches of veins.

The optic nerve passes in at the posterior part of the eye, in a considerable trunk, to be expanded for the purposes of vision, of which it is now universally supposed to be the immediate seat. But Messrs Mariotte and Mery contended, that the choroides is the seat of this sense; and the ancients supposed the crystalline to be so. Besides the optic, the eye receives branches from the third, fourth, fifth, and sixth pair of nerves.

The humours of the eye, together with the cornea, are calculated to refract and converge the rays of light in such a manner as to form at the bottom of the eye a distinct image of the object we look at; and the point where these rays meet is called the *focus* of the eye. On the retina, as in a *camera obscura*, the object is painted in an inverted position; and it is only by habit that we are enabled to judge of its true situation, and likewise of its distance and magnitude. To a young gentleman who was born blind, and who was couched by Mr Chefelden, every object (as he expressed himself) seemed to touch his eyes as what he felt did his skin; and he thought no objects so agreeable as those which were smooth and regular, although for some time he could form no judgment of their shape, or guess what it was in any of them that was pleasing to him.

In order to paint objects distinctly on the retina, the cornea is required to have such a degree of convexity, that the rays of light may be collected at a certain point, so as to terminate exactly on the retina.—If the cornea is too prominent, the rays, by diverging too soon, will be united before they reach the retina, as is the case with near-sighted people or *myopes*; and on the contrary, if it is not sufficiently convex, the rays will not be perfectly united when they reach the back-part of the eye; and this happens to long-sighted people or *presbi*, being found constantly to take place as we approach to old age, when the eye gradually flattens (F). These defects are to be supplied by means of glasses He who has too prominent an eye, will find his vision improved by means of a concave glass; and upon the same principles, a convex glass will be found useful to a person whose eye is naturally too flat.

EXPLANATION OF PLATE XXVII.

Figure 1. Shows the Lachrymal Canals, after the Common Teguments and Bones have been cut away.

a, The lachrymal gland. b, The two puncta lachrymalia, from which the two lachrymal canals proceed to c, the lacrymal sac. d, The large lachrymal duct. e, Its opening into the nose. f, The caruncula lachrymalis. g, The eye-ball.

Fig. 2. An interior View of the Coats and Humours of the Eye.

a a a a, The tunica sclerotica cut in four angles, and turned back. b b b b, The tunica choroides adhering to the inside of the sclerotica, and the ciliary vessels are seen passing over—c c, The retina, which covers the vitreous humour. d d, The ciliary processes, which were continued from the choroid coat. e e, The iris. f, The pupil.

Fig. 3. Shows the Optic Nerves, and Muscles of the Eye.

a a, The two optic nerves before they meet. b, The two optic nerves conjoined. c, The right optic nerve. d, Musculus attollens palpebræ superioris. e, Attollens oculi. f, Abductor. g g, Obliquus superior, or trochlearis. h, Adductor. i, The eye-ball.

Fig. 4 Shows the Eye-ball with its Muscles.

a, The optic nerve. b, Musculus trochlearis. c, Part of the os frontis, to which the trochlea or pully is fixed, through which,—d, The tendons of the trochlearis passes. e, Attollens oculi. f, Adductor oculi. g, Abductor oculi. h, Obliquus inferior. i, Part of the superior maxillary bone to which it is fixed. k, The eye-ball.

Fig. 5. Represents the Nerves and Muscles of the Right Eye, after part of the Bones of the Orbit have been cut away.

A, The eye-ball. B, The lachrymal gland. C, Musculus abductor oculi. D, Attollens. E, Levator palpebræ superioris. F, Depressor oculi. G, Adductor. H, Obliquus superior, with its pulley. I, Its insertion into the sclerotic coat. K, Part of the obliquus inferior. L, The anterior part of the os frontis cut. M, The crista galli of the ethmoid bone. N, The posterior part of the sphenoid bone. O, Transverse spinous process of the sphenoid bone. P, The carotid artery, denuded where it passes through the bones. Q, The carotid artery within the cranium. R, The ocular artery.

Nerves.—a a, The optic nerve. b, The third pair.—c, Its joining with a branch of the first branch of the fifth pair, to form l, the lenticular ganglion,—which sends off the ciliary nerves, d. e e, The fourth pair. f, The trunk of the fifth pair. g, The first branch of the fifth pair, named ophthalmic.—h, The frontal branch of it. i, Its ciliary branches, along with which the nasal twig is sent to the nose. k, Its branch to the lachrymal gland. l, The lenticular ganglion. m, The second branch of the fifth pair, named superior maxillary. n, The third branch of the fifth pair, named inferior maxillary. o, The sixth pair of

from its bed in the vitreous humour. In this operation the cornea is perforated, and the aqueous humour escapes out of the eye, but it is constantly renewed again in a very short time. The manner however in which it is secreted, has not yet been determined.

(F) Upon this principle, they who in their youth are near-sighted may expect to see better as they advance in life, as their eyes gradually become more flat.

A Bell Sculp.

Of the Senses.

of nerves,—which sends off p, The beginning of the great sympathetic. q, The remainder of the sixth pair, spent on c, The abductor oculi.

Fig. 6. Represents the head of a youth, where the upper part of the cranium is sawed off,—to show the upper part of the brain, covered by the pia mater, the vessels of which are minutely filled with wax.

A A, The cut edges of the upper part of the cranium. B, The two tables and intermediate diploë. B B, The two hemispheres of the cerebrum. C C. The incisure made by the falx. D, Part of the tentorium cerebello super expansum. E, Part of the falx, which is fixed to the crista galli.

Fig. 7. Represents the parts of the External Ear, with the Parotid Gland and its Duct.

a a, The helix. b, The antihelix. c, The antitragus. d, The tragus. e, The lobe of the ear. f, The cavitas innominata. g, The scapha. h, The concha. i i, The parotid gland. k, A lymphatic gland, which is often found before the tragus. l, The duct of the parotic gland. m, Its opening into the mouth.

Fig. 8. A view of the posterior part of the external ear, meatus auditorius, tympanum, with its small bones, and Eustachian tube of the right side.

a, The back part of the meatus, with the small ceruminous glands. b, The incus. c, Malleus. d, The chorda tympani. e, Membrana tympani. f, The Eustachian tube. g, Its mouth from the fauces.

Fig. 9. Represents the anterior part of the right external ear, the cavity of the tympanum—its small bones, cochlea, and semicircular canals.

a, The malleus. b, Incus with its long leg, resting upon the stapes. c, Membrana tympani. d, e, The Eustachian tube, covered by part of —f f, The musculus circumflexus palati. 1, 2, 3, The three semicircular canals. 4, The vestible. 5, The cochlea. 6, The portio mollis of the seventh pair of nerves.

Fig. 10. Shows the Muscles which compose the fleshy substance of the Tongue.

a a, The tip of the tongue, with some of the papillæ minimæ b, The root of the tongue. c, Part of the membrane of the tongue, which covered the epiglottis. d d, Part of the musculus hyo-glossus. e, The lingualis. f, Genio-glossus. g g, Part of the stylo-glossus.

Anaxagoras

Anatomy of Plants. See Plants.

Anatomy of Brutes. See *Comparative Anatomy.*

ANAXAGORAS, one of the most celebrated philosophers of antiquity, was born at Clazomene in Ionia about the 70th Olympiad. He was disciple of Anaximenes; and gave up his patrimony, to be more at leisure for the study of philosophy. He went first to Athens, and there taught eloquence; after which, having put himself under the tuition of Anaximenes, he gave lessons in philosophy in the same city. These he only gave to some particular friends and disciples, and with extreme caution. This, however, did not prevent, but rather was the cause of, his being accused of impiety, and thrown into prison, notwithstanding the credit and influence of Pericles, who was his disciple and intimate. Having been condemned to exile, he calmly yielded to the efforts of envy, and opened school at Lampsacum, where he was extremely honoured during the remainder of his life, and still more after his death, having had statues erected to his memory. He is said to have made some predictions relative to the phenomena of nature, upon which he wrote some treatises. His principal tenets may be reduced to the following:—All things were in the beginning confusedly placed together, without order and without motion. The principle of things is at the same time one and multiplex, which obtained the name of *homœmeries*, or similar particles, deprived of life. But there is beside this, from all eternity, another principle, namely an infinite and incorporeal spirit, who gave these particles a motion; in virtue of which, such as are homogeneal united, and such as were heterogeneal separated according to their different kinds. In this manner all things being put into motion by the spirit, and similar things being united to such as were similar, such as had a circular motion produced heavenly bodies, the lighter particles ascended, those which were heavy descended. The rocks of the earth, being drawn up by the force of the air, took fire, and became stars, beneath which the sun and moon took their stations. Thus he did not look upon the stars as divinities.

Anaxarchus || Anaximenes.

ANAXARCHUS, a philosopher of Abdera, highly esteemed by Alexander the Great. His end was peculiarly tragical: having the misfortune to fall into the hands of the enemy, they pounded him alive in a mortar.

ANAXIMANDER, a famous Greek philosopher, born at Miletus in the 42d olympiad, in the time of Polycrates tyrant of Samos. He was the first who publicly taught philosophy, and wrote upon philosophical subjects. He carried his researches into nature very far for the time in which he lived. It is said, that he discovered the obliquity of the Zodiac, was the first who published a geographical table, invented the gnomon, and set up the first sun-dial in an open place at Lacedæmon. He taught, that infinity of things was the principal and universal element; that this infinite always preserved its unity, but that its parts underwent changes; that all things came from it; and that all were about to return into it. According to all appearance, he meant by this obscure and indeterminate principle the chaos of the other philosophers. He asserted, that there are an infinity of worlds; that the stars are composed of air and fire, which are carried in their spheres, and that these spheres are gods; and that the earth is placed in the midst of the universe, as in a common centre. He added, that infinite worlds were the product of infinity, and that corruption proceeded from separation.

ANAXIMENES, born at Miletus, an eminent Greek philosopher, friend, scholar, and successor of Anaximander. He diffused some degree of light upon the obscurity of his master's system. He made the first principle of things to consist in the air, which he considered

ſidered as immenſe or infinite, and to which he aſcribed a perpetual motion. He aſſerted, that all things which proceeded from it were definite and circumſcribed; and that this air, therefore, was God, ſince the divine power reſided in it and agitated it. Coldneſs and moiſture, heat and motion, rendered it viſible, and dreſſed it in different forms, according to the different degrees of its condenſation. All the elements thus proceed from heat and cold. The earth was, in his opinion, one continued flat ſurface.

ANAXIMENES, the ſon of Ariſtocles of Lampſacus, an orator, the diſciple of Diogenes the Cynic, and of Zoilus the railer againſt Homer. He was preceptor to Alexander of Macedon, and followed him to the wars. Alexander being incenſed againſt the people of Lampſacus, they ſent this philoſopher to intercede for them. Alexander knowing the cauſe of his coming, ſwore that he would do the very reverſe of whatever he deſired of him. Anaximenes begged of him to deſtroy Lampſacus. Alexander, unwilling to break his oath, and not able to elude this ſtratagem, pardoned Lampſacus much againſt his will.

ANAXIMANDRIANS, in the hiſtory of philoſophy, the followers of Anaximander; the moſt ancient of the philoſophical atheiſts, who admitted of no other ſubſtance in nature but matter.

ANAZARBUS (Pliny), ANAZARBA (Stephanus); a town of Cilicia, on the river Pyramus, the birth place of Dioſcorides, and of the poet Oppian. It was ſometimes called *Cæſarea*, in honour either of Auguſtus or of Tiberius. The inhabitants are called *Anazarbeni* (Pliny), and on coins *Anazarbeis*, after the Greek idiom. It was deſtroyed by a dreadful earthquake in the year 525, along with ſeveral other important cities: but they were all repaired at a vaſt expence by the emperor Juſtin; who was ſo much affected with their misfortune, that, putting off the diadem and purple, he appeared for ſeveral days in ſackcloth.

ANBERTKEND, in the eaſtern language, a celebrated book of the Brachmans, wherein the Indian philoſophy and religion are contained. The word in its literal ſenſe denotes the ciſtern wherein is the water of life. The anbertkend is divided into 50 beths, or diſcourſes, each of which conſiſts of ten chapters. It has been tranſlated from the original Indian into Arabic, under the title of *Morat al Maani*, q. d. *the marrow of intelligence*.

ANCARANO, a town of Italy, in the march of Ancona, ſituated in E. Long. 14. 54. N. Lat. 42. 48.

ANCASTER, a town of Lincolnſhire, ſituated in W. Long. 30. N. Lat. 52. 30. It gives title of duke to the noble family of Bertie.

ANCENIS, a town of France, in the province of Britany. W. Long. 1. 9. N. Lat. 47. 20.

ANCESTORS, thoſe from whom a perſon is deſcended in a ſtraight line. The word is derived from the Latin *anceſſor*, contracted from *anteceſſor*, q. d. *goer before*.

Moſt nations have paid honours to their anceſtors. It was properly the departed ſouls of their forefathers that the Romans worſhipped under the denominations of *lares*, *lemures*, and *houſehold gods*. Hence the ancient tombs were a kind of temples, or rather altars, wherein oblations were made by the kindred of the deceaſed.

The Ruſſians have ſtill their anniverſary feaſts in memory of their anceſtors, which they call *roditoli ſabot*, q. d. *kinsfolk's ſabbath*, wherein they make formal viſits to the dead in their graves, and carry them proviſions, eatables, and preſents of divers other kinds. They interrogate them, with loud lamentable cries, What they are doing? How they ſpend their time? What it is they want? and the like.

The Quojas, a people of Africa, offer ſacrifices of rice and wine to their anceſtors before ever they undertake any conſiderable action. The anniverſaries of their deaths are always kept by their families with great ſolemnity. The king invokes the ſoul of his father and mother to make trade flouriſh and the chace ſucceed.

The Chineſe ſeem to have diſtinguiſhed themſelves above all other nations in the veneration they bear their anceſtors. By the laws of Confucius, part of the duty which children owe their parents conſiſts in worſhipping them when dead. This ſervice, which makes a conſiderable part of the natural religion of the Chineſe, is ſaid to have been inſtituted by the emperor Kun, the fifth in order from the foundation of that ancient empire. Bibl. Un. tom. vii. The Chineſe have both a ſolemn and ordinary worſhip which they pay their anceſtors. The former is held regularly twice a-year, viz. in ſpring and autumn, with much pomp. A perſon who was preſent at it gives the following account of the ceremonies on that occaſion: The ſacrifices were made in a chapel well adorned, where there were ſix altars furniſhed with cenſers, tapers, and flowers. There were three miniſters, and behind them two young acolites. The three former went with a profound ſilence, and frequent genuflexions towards the five altars, pouring out wine: afterwards they drew near to the ſixth, and when they came to the foot of the altar, half bowed down, they ſaid their prayers with a low voice. That being finiſhed, the three miniſters went to the altar, the officiating prieſt took up a veſſel full of wine, and drank; then he lifted up the head of a deer or goat; after which taking fire from the altar, they all lighted a bit of paper; and the miniſter of the ceremonies turning towards the people, ſaid with a high voice, that he gave them thanks in the name of their anceſtors for having ſo well honoured them; and in recompence he promiſed them, on their part, a plentiful harveſt, a fruitful iſſue, good health, and long life, and all thoſe advantages that are moſt pleaſing to men.

The Chineſe give their anceſtors another ſimpler and more private worſhip. To this end they have in their houſes a niche or hollow place, where they put the names of their deceaſed fathers, and make prayers and offerings of perfumes and ſpices to them at certain times, with bowing, &c. They do the like at their tombs.

The Jews ſettled in China are ſaid to worſhip their anceſtors like the heathens, and with the ſame ceremonies, except that they offer not ſwine's fleſh. Near their ſynagogue they have a hall, or court of anceſtors, wherein are niches for Abraham, Iſaac, &c. The Jeſuits alſo conformed, and were permitted by their general

neral to conform to this and many other ſuperſtitious cuſtoms of the Chineſe.

There is one peculiarity of another kind, wherein the Chineſe ſhow their regard for their anceſtors; in proportion as any of their deſcendants are preferred to a higher degree or dignity, their dead anceſtors are at the ſame time preferred and ennobled with them. The kings Ven, Van, Veu, Van, and Cheu, Cum, who were deſcended from vaſſal kings, when they mounted the imperial throne, raiſed their anceſtors from the vaſſal or depending ſtate wherein theſe had lived to the dignity of emperors; ſo that the ſame honours were for the future rendered them as if they had been emperors of China. The ſame example was followed by the ſubſequent kings, and now obtains among the grandees and literati; all now worſhip their anceſtors, according to the rank which they themſelves hold in the world. If the ſon be a mandarin and the father only a doctor, the latter is buried as a doctor, but ſacrificed to as a mandarin. The like holds in degradations, where the condition of the fathers is that of their ſons.

ANCHILOPS, αγκυλη, *contraction*, and ωψ, *eye;* in medicine, denotes an abſceſs, or collection of matter, between the great angle of the eye and the noſe. If ſuffered to remain too long, or unſkilfully managed, it degenerates, the ſtagnating humours corrupt, and an ulcer is produced. When the tumor is broke, and the tears flow involuntarily, whilſt the os lacrymale is not carious, it is an *ægylops;* but when the ulcer is of a long ſtanding, deep, fetid, and the os lacrymale becomes carious, it is a *fiſtula*. The cure is by reſtriction and exciſion, tying it at the root on the glandula lacrymalis, and, when ready, cutting it off. See SURGERY-*Index*.

ANCHISES, in fabulous hiſtory, a Trojan prince, deſcended from Dardanus, and the ſon of Capys. Venus made love to him in the form of a beautiful nymph; and bore him Æneas, the hero of Virgil's Æneid.

ANCHOR (*anchora*, Lat. from αγκυρα, Greek), a heavy, ſtrong, crooked inſtrument of iron, dropped from a ſhip into the bottom of the water, to retain her in a convenient ſtation in a harbour, road, or river.

The moſt ancient anchors are ſaid to have been of ſtone; and ſometimes of wood, to which a great quantity of lead was uſually fixed. In ſome places, baſkets full of ſtones, and ſacks filled with ſand, were employed for the ſame uſe. All theſe were let down by cords into the ſea, and by their weight ſtayed the courſe of the ſhip. Afterwards they were compoſed of iron, and furniſhed with teeth, which, being faſtened to the bottom of the ſea, preſerved the veſſel immoveable; whence οδοντης and *dentes* are frequently taken for anchors in the Greek and Latin poets. At firſt there was only one tooth, whence anchors were called ετεροστομοι: but in a ſhort time the ſecond was added by Eupalamus, or Anacharſis, the Scythian philoſopher. The anchors with two teeth were called αμφιβολοι, or αμφιστομοι; and from ancient monuments appear to have been much the ſame with thoſe uſed in our days, only the tranſverſe piece of wood upon their handles (the ſtock) is wanting in all of them. Every ſhip had ſeveral anchors; one of which, ſurpaſſing all the reſt in bigneſs and ſtrength, was peculiarly termed ιερα or *ſacra*, and was never uſed but in extreme danger; whence *ſacram anchoram ſolvere*, is proverbially applied to ſuch as are forced to their laſt refuge.

The anchors now made are contrived ſo as to ſink into the ground as ſoon as they reach it, and to hold a great ſtrain before they can be looſened or diſlodged from their ſtation. They are compoſed of a ſhank, a ſtock, a ring, and two arms with their flukes. The ſtock, which is a long piece of timber fixed acroſs the ſhank, ſerves to guide the flukes in a direction perpendicular to the ſurface of the ground; ſo that one of them ſinks into it by its own weight as ſoon as it falls, and is ſtill preſerved ſteadily in that poſition by the ſtock, which, together with the ſhank, lies flat on the bottom. In this ſituation it muſt neceſſarily ſuſtain a great effort before it can be dragged through the earth horizontally. Indeed this can only be effected by the violence of the wind or tide, or both of them, ſometimes increaſed by the turbulence of the ſea, and acting upon the ſhip ſo as to ſtretch the cable to its utmoſt tenſion, which accordingly may diſlodge the anchor from its bed, eſpecially if the ground be ſoft and oozy, or rocky. When the anchor is thus diſplaced, it is ſaid, in the ſea-phraſe, to *come home*.

That the figure of this uſeful inſtrument may be more clearly underſtood, let us ſuppoſe a long maſſy beam of iron erected perpendicularly, *b*, at the lower end of which are two arms, *d e*, of equal thickneſs with the beam (uſually called the *ſhank*), only that they taper towards the points, which are elevated above the horizontal plane at an angle of 30 degrees, or inclined to the ſhank at an angle of 60 degrees; on the upper part of each arm (in this poſition) is a fluke or thick plate of iron, *g h*, commonly ſhaped like an iſoſceles triangle whoſe baſe reaches inwards to the middle of the arm. On the upper end of the ſhank is fixed the ſtock tranſverſely with the flukes; the ſtock is a long beam of oak, *f*, in two parts, ſtrongly bolted, and hooped together with iron rings. See alſo N° 2. Cloſe above the ſtock is the ring *a*, to which the cable is faſtened, or *bent:* the ring is curiouſly covered with a number of pieces of ſhort rope, which are twiſted about it ſo as to form a very thick texture or covering called the *puddening*, and uſed to preſerve the cable from being fretted or chafed by the iron.

Plate XXIX. fig. 1. n° 1.

Every ſhip has, or ought to have, three principal anchors, with a cable to each, viz. the ſheet, *maitreſſe-ancre*, (which is the *anchora ſacra* of the ancients); the beſt bower, *ſecond ancre;* and ſmall bower, *ancre d'aſſourche*, ſo called from their uſual ſituation on the ſhip's bows. There are beſides ſmaller anchors, for removing a ſhip from place to place in a harbour or river, where there may not be room or wind for ſailing; theſe are the ſtream-anchor, *ancre de toue;* the kedge and grappling, *grapin:* this laſt, however, is chiefly deſigned for boats.

Method of Making ANCHORS. The goodneſs of the anchor is a point of great importance. Great care is therefore to be taken, that the metal it is made of be neither too ſoft nor too brittle; the latter rendering it liable to break and the former to ſtraiten.

The ſhank, arms, and flukes, are firſt forged ſeparately; then the hole is made at one end of the ſhank for the ring, which being alſo previouſly forged, is

 put into the hole of the ſhank, and the two ends ſhut together. After which the arms are ſhut to the ſhank, one after the other, and the anchor is finiſhed.

Proof is made of anchors, by raiſing them to a great height, and then letting them fall again on a kind of iron block placed acroſs for the purpoſe. To try whether the flukes will turn to the bottom and take hold of the ground, they place the anchor on an even ſurface, with the end of one of the flukes, and one of the ends of the ſtock reſting on the ſurface; in caſe the anchor turns, and the point of the fluke riſes upwards, the anchor is good.

In England, France, and Holland, anchors are made of forged iron; but in Spain they are ſometimes made of copper, and likewiſe in ſeveral parts of the South Sea.

For the proportions of anchors, according to Manwaring, the ſhank is to be thrice the length of one of the flukes, and half the length of the beam. According to Aubin, the length of the anchor is to be four tenths of the greateſt breadth of the ſhip; ſo that the ſhank, *e. gr.* of an anchor in a veſſel 30 feet wide, is to be 12 feet long. When the ſhank is, for inſtance, eight feet long, the two arms are to be ſeven feet long, meaſuring them according to their curvity. As to the degree of curvity given the arms, there is no rule for it; the workmen are here left to their own diſcretion.

The latter writer obſerves, that the anchor of a large heavy veſſel is ſmaller, in proportion, than that of a leſſer and lighter one. The reaſon he gives is, that though the ſea employs an equal force againſt a ſmall veſſel as againſt a great one, ſuppoſing the extent of wood upon which the water acts to be equal in both, yet the little veſſel, by reaſon of its ſuperior lightneſs, does not make ſo much reſiſtance as the greater; the defect whereof muſt be ſupplied by the weight of the anchor.

From theſe, and other hydroſtatic principles, the following table has been formed; wherein is ſhown, by means of the ſhip's breadth within, how many feet the beam or ſhank ought to be long, giving it four-tenths or two-fifths of the ſhip's breadth within: by which proportion might be regulated the length of the other parts of the anchor. In this table is repreſented likewiſe the weight an anchor ought to be for a ſhip from eight feeet broad to 45, increaſing by one foot's breadth; ſuppoſing that all anchors are ſimilar, or that their weights are as the cubes of the lengths of the ſhanks.

Breadth of the Veſſel. Feet.	Length of the Anchor. Feet.	Weight. Pounds.
8	$3\frac{1}{5}$	33
9	$3\frac{3}{5}$	47
10	4	64
11	$4\frac{2}{5}$	84
12	$4\frac{4}{5}$	110
13	$5\frac{1}{5}$	140
14	$5\frac{2}{5}$	175
15	6	216
16	$6\frac{2}{5}$	262
17	$6\frac{4}{5}$	314
18	$7\frac{2}{5}$	373
19	$7\frac{3}{5}$	439
20	8	512
21	$8\frac{2}{5}$	592
22	$8\frac{4}{5}$	681
23	$9\frac{1}{5}$	778
24	$9\frac{3}{5}$	884
25	10	1000
26	$10\frac{2}{5}$	1124
27	$10\frac{4}{5}$	1259
28	$11\frac{1}{5}$	1405
29	$11\frac{3}{5}$	1562
30	12	1728
31	$12\frac{2}{5}$	1906
32	$12\frac{4}{5}$	2097
33	$13\frac{1}{5}$	2300
34	$13\frac{3}{5}$	2515
35	14	2742
36	$14\frac{2}{5}$	2986
37	$14\frac{4}{5}$	3242
38	$15\frac{1}{5}$	3512
39	$15\frac{3}{5}$	3796
40	16	4096
41	$16\frac{2}{5}$	4426
42	$16\frac{4}{5}$	4742
43	$17\frac{1}{5}$	5088
44	$17\frac{3}{5}$	5451
45	18	5832

M. Bouguer, in his *Traité de Navire*, directs to take the length of the ſhank in inches, and to divide the cube of it by 1160 for the weight. The reaſon is obvious; becauſe the quotient of the cube of 201 inches, which is the length of an anchor weighing 7000 lb. divided by the weight, is 1160; and therefore, by the rule of three, this will be a common diviſor for the cube of any length, and a ſingle operation will ſuffice.

The ſame author gives the following dimenſions of the ſeveral parts of an anchor. The two arms generally form the arch of a circle, whoſe centre is three-eighths of the ſhank from the vertex, or point where it is fixed to the ſhank; and each arm is equal to the ſame length, or the radius; ſo that the two arms together make an arch of 120 degrees: the flukes are half the length of the arms, and their breadth two-fifths of the ſaid length. With reſpect to the thickneſs, the circumference at the throat, or vertex of the ſhank, is generally made about the fifth part of its length, and the ſmall end two thirds of the throat; the ſmall end of the arms of the flukes, three-fourths of the circumference of the ſhank at the throat. Theſe dimenſions ſhould be bigger, when the iron is of a bad quality, eſpecially if caſt iron is uſed inſtead of forged iron.

At Anchor, the ſituation of a ſhip which rides by her anchor in a road or haven, &c. Plate XXIX. fig. 1. N° 3. repreſents the fore part of a ſhip as riding in this ſituation. See alſo Buoy-Rope.

To fiſh the Anchor, to draw up the flukes upon the ſhip's ſide after it is catted. See the articles Davit and Fish.

To ſteer the Ship to her Anchor, is to ſteer the ſhip's head towards the place where the anchor lies when they are heaving the cable into the ſhip; that the cable may thereby enter the hauſe with leſs reſiſtance, and the ſhip advance towards the anchor with greater facility.

Anchor-Ground is a bottom which is neither too deep, too ſhallow, nor rocky; as in the firſt the cable bears too nearly perpendicular, and is thereby apt to jerk the anchor out of the ground; in the ſecond, the ſhip's bottom is apt to ſtrike at low water, or when the ſea runs high, by which ſhe is expoſed to the danger of ſinking; and in the third, the anchor is liable to hook the broken and pointed ends of rocks, and tear away its flukes, whilſt the cable, from the ſame cauſe, is conſtantly in danger of being cut through as it rubs on their edges.

Anchor, in architecture, is a ſort of carving, ſomewhat reſembling an anchor. It is commonly placed as part of the enrichments of the boultins of capitals of the Tuſcan, Doric, and Ionic orders, and alſo of the boultins of bed-mouldings of the Doric, Ionic, and Corinthian cornices, anchors and eggs being carved alternately through the whole building.

Anchors, in heraldry, are emblems of hope, and are taken for ſuch in a ſpiritual as well as a temporal ſenſe.

Anchorage, in law, is a duty upon ſhips for the uſe of the port or harbour where they caſt anchor.

ANCHOVY, in ichthyology, the Engliſh name of the clupea encraſicolus. See Clupea.

ANCHOVY-pear. See Grias.

ANCHUSA, Alkanet or Bugloss: A genus of the monogynia order belonging to the pentandria claſs of plants; and in the natural method ranking under the 41ſt order, *Aſperifoliæ*. The *calyx* is a quinquepartite perianthium, oblong and perſiſtent: The *corolla* is monopetalous and funnel-ſhaped, the throat cloſed with ſcales: The *ſtamina* conſiſt of five ſhort filaments; the antheræ oblong and covered: The *piſtillum* has four germina, a filiform ſtylus, and obtuſe ſtigma: There is no *pericarpium*, the calyx containing the ſeeds in its boſom: The *ſeeds* are four, oblong, gibbous, and engraven at the baſe.

Species. 1. The officinalis, or greater garden-bugloſs, is a native of France and of the warmer parts of Europe, but will thrive well enough in Britain; but the roots ſeldom continue longer than two years in this country, unleſs they happen to grow in rubbiſh, or out of an old wall, where they will live three or four years. 2. The anguſtifolia, or perennial wild borage, grows to the height of two feet when cultivated in gardens; but in thoſe places where it grows wild is ſeldom more than a foot and an half high. The leaves of this ſort are narrow; the ſpikes of flowers come out double, and have no leaves about them; the flowers are ſmall, and of a red colour. The roots will continue two years in a poor ſoil. 3. The undulata, or Portugal bugloſs, is a biennial plant, which grows to the height of two feet, and ſends out many lateral branches. The flowers are of a bright blue colour, and grow in an imbricated ſpike. 4. The orientalis, or eaſtern bugloſs, is a native of the Levant; but hardy enough to bear the open air in Britain, if it hath a dry ſandy ſoil. It is a perennial plant, with long trailing branches which lie on the ground. The flowers are yellow, and about the ſize of the common bugloſs, and there is a ſucceſſion of theſe on the ſame plants great part of the year. 5. The virginiana, or puccoon, grows naturally in the woods of North America; and being an early plant, generally flowers before the new leaves come out on the trees; ſo that in ſome woods where it abounds, the ground ſeems entirely covered with its yellow flowers. It is a perennial plant, which ſeldom riſes a foot high in good ground, but not above half that height where the ſoil is poor. The flowers grow in looſe ſpikes upon ſmooth ſtalks. 6. The ſempervirens, or evergreen borage, is a very hardy perennial plant, with weak trailing branches. It grows naturally in ſome parts of Britain and Spain. The flowers are blue, and come out between the leaves on the ſpike, like the fourth ſort. They appear during a great part of the year. 7. The cretica, or warted bugloſs of Crete, is a low trailing annual plant, whoſe branches ſeldom extend more than ſix inches. The flowers are ſmall, of a bright blue colour, and are collected into ſmall bunches at the extremity of the branches. The plants periſh ſoon after their ſeeds are ripe. 8. The tinctoria, or true alkanet, grows naturally in the Levant, but is equally hardy with the firſt ſpecies. The flowers grow in long ſpikes, coming out *imbricatim*, like the tiles of a houſe.

Culture. All the ſpecies of anchuſa may be propagated by ſeeds; which ſhould be ſown, either in the ſpring or autumn, upon a bed of light ſandy earth; and when the plants are ſtrong enough to be removed, they muſt be planted on beds at two feet diſtance from one another, and watered, if the ſeaſon requires it, till they have taken root; after which they will require no other care than to keep them free from weeds.

Medicinal Uſes, &c. The flowers of the firſt ſpecies have obtained the name of *cordial* flowers; to which they have no other title than that they moderately cool and ſoften, without offending, the palate or ſtomach; and thus, in warm climates, or in hot diſeaſes, may in ſome meaſure refreſh the patient. The root of the tinctoria is likewiſe uſed, not as poſſeſſed of any medicinal virtue, but on account of its imparting an elegant red colour to oily ſubſtances; ſo is frequently directed as a colouring ingredient for ointments, plaſters, &c. As the colour is confined to the cortical part, the ſmall roots are to be preferred, as having proportionably more bark than the large ones. The alkanet root which grows in England is greatly inferior to what comes from abroad.

ANCHYLOBLEPHARON. See Ancyloblepharon.

ANCHYLOPS. See Anchilops.

ANCHYLOSIS. See Ancylosis.

ANCIENT, or Antient, a term applied to things which exiſted long ago; thus we ſay, ancient nations, ancient cuſtoms, &c. See Antiquities.

Ancient, ſometimes denotes elderly, or of long ſtanding, in oppoſition to young, or new; thus we ſay, an ancient barriſter, ancient buildings.

Ancient, in a military ſenſe, denotes either the enſign or colours.

Ancient, in ſhips of war, the ſtreamer or flag borne in the ſtern.

ANCIENT demesne, in Engliſh law, is a tenure, whereby all manors belonging to the crown in William the Conqueror's and St Edward's time were held. The numbers, names, &c. hereof were entered by the Conqueror, in a book called *Domeſday Book*, yet remaining in the Exchequer; ſo that ſuch lands as by that book appeared to have belonged to the crown at

that time, are called *ancient demesne*.—The tenants in ancient demesne are of two sorts; one who hold their lands frankly by charter; the other by copy of court-roll, or by the verge, at the will of the lord, according to the custom of the manor.—The advantages of this tenure are, 1. That tenants holding by charter cannot be rightfully impleaded out of their manor; and, when they are, they may abate the writ, by pleading the tenure. 2. They are free from toll for all things relating to their livelihood and husbandry; nor can be impannelled on any inquest.—These tenants held originally by plowing the king's land, plashing his hedges, and the like service, for the maintenance of his household; and it was on this account that such liberties were given them, for which they may have writs of *monstraverunt* to such as take the duties of toll, &c.—No lands are to be account . ancient demesne, but such as are held in socage. Whether land be ancient demesne or not, shall be tried by the Book of DOMESDAY.

ANCIENTY, in some ancient statutes, is used for eldership or seniority. The elder sister can demand no more than her other sisters, beside the chief mesne, by reason of her ancienty. This word is used in the statute of Ireland, 14 Hen. III.

ANCILLON (David), a minister of the reformed church at Metz, where he was born the 17th of March 1617. He studied from the ninth or tenth year of his age in the Jesuits college, where he gave such proofs of his genius, that the heads of the society tried every means to draw him over to their religion and party; but he continued firm against their attacks. He went to Geneva in 1623; and studied divinity under Spanheim, Diodati, and Tronchin, who conceived a very great esteem for him. He left Geneva in April 1641, and offered himself to the synod of Charenton in order to take upon him the office of a minister: his abilities were greatly admired by the examiners, and the whole assembly were so highly pleased with him, that they gave him the church of Meaux, the most considerable then unprovided for. Here he acquired a vast reputation for his learning, eloquence, and virtue, and was even highly respected by those of the Roman-catholic communion. He returned to his own country in the year 1653, where he remained till the revocation of the edict of Nantes in 1685. He retired to Francfort after this fatal blow; and having preached in the French church at Hanau, the whole congregation were so edified by it, that they immediately called together the heads of the families, in order to propose that he might be invited to accept of being minister there. The proposition was agreed to; and he began the exercise of his ministry in that church about the end of the year 1685. His preaching made so great a noise at Hanau, that the professors of divinity, and the German and Dutch ministers, attended his sermons frequently: the count of Hanau himself, who had never before been seen in the French church, came thither to hear Mr Ancillon: they came from the neighbouring parts, and even from Francfort; people who understood nothing of French flocked together with great eagerness, and said they loved to see him speak. This occasioned a great jealousy in the two other ministers; which tended to make his situation uneasy. He therefore went to Berlin; where he met with a kind reception from his highness the elector, and was made minister of the city. Here he had the pleasure of seeing his eldest son made judge and director of the French in the same city, and his other son rewarded with a pension and entertained at the university of Francfort upon the Oder. He had likewise the satisfaction of seeing his brother made judge of all the French in the states of Brandenburg; and Mr Cayart his son-in-law, engineer to his electoral highness. He enjoyed these agreeable circumstances, and several others, till his death, which happened at Berlin the 3d of September, 1692, when he was 75 years of age.—Mr Ancillon having got a considerable fortune by marriage, was enabled thereby to gratify his passion for books; his library was accordingly very curious and large, and he increased it every day with all that appeared new and important in the republic of letters, so that at last it was one of the noblest collections in the hands of any private person in the kingdom. He published a book, in quarto, in which the whole dispute concerning Traditions is fully examined: he also wrote an apology for Luther, Zuinglius, Calvin, and Beza, and several other pieces.

ANCLAM, a strong town of Germany, in the circle of Upper Saxony, and duchy of Pomerania, remarkable for its excellent pastures. It is seated on the river Pene. E. Long. 14. 5. N. Lat. 54 10.

ANCLE, or ANKLE. See ANKLE.

ANCONA (marquisate of), a province in the pope's territories in Italy. It lies between the gulph of Venice and mount Appenine, which bound it on the north; Abruzzo on the east; the duchy of Spoletto, and that of Urbino, on the west. The air is indifferent; but the soil is fruitful, particularly in hemp and flax; and there is great plenty of wax and honey. It contains several large towns, as Fermo, Loretto, Recanati, Macerata, Jesi, Tolentino, Ascoli, Osimo, St Severino, Monte Alto, Camerino, and Ripatransone, which are all archiepiscopal or episcopal sees.

ANCONA, a sea-port town of Italy, the capital of the marquisate of that name, and the see of a bishop. It was formerly the finest port in all Italy, being built by the emperor Trajan, about the year 115; but was almost ruined, and its trade lost: however, it has again begun to revive. Its harbour is the best in all the pope's dominions. The town lies round it on two hills; one of which is at the point of Cape St Syriaco, from whence there is a delightful prospect. On the other stands the citadel, which commands the town and harbour. The streets of this city are narrow and uneven; and the public and private buildings inferior to those of the other great towns in Italy. The cathedral is a low dark structure; and though the front is covered with fine marble, the architecture has neither beauty nor regularity. The church of St Dominic, and that of the Franciscans, have each an excellent picture of Titian. The exchange, where the merchants meet, is a handsome square portico, in which is an equestrian statue of Trajan, who first built the port. At the four corners are four other statues. The triumphal arch of Trajan remains almost entire, with its inscription. The common people in this town are a little particular and fantastical in their dress, but the better sort follow the French mode. It is a great thoroughfare from the north of Italy to Loretto; which renders provisions very dear,

dear. The tide does not rise here above a foot, and near the Mediterranean it is scarce visible. E. Long. 15. 5. N. Lat. 43. 36.

ANCONES, in architecture, the corners or quoins of walls, cross-beams, or rafters.—Vitruvius calls the *consoles* by the same name.

ANCONY, in the iron-works, a piece of half-wrought iron, of about three quarters of 100 weight, and of the shape of a bar in the middle, but rude and unwrought at the ends. The process for bringing the iron to this state is this: They first melt off a piece from a sow of cast iron, of the proper size; this they hammer at the forge into a mass of two feet long, and of a square shape, which they call a *bloom;* when this is done, they send it to the finery; where, after two or three heats and workings, they bring it to this figure, and call it an *ancony*. The middle part beat out at the finery, is about three feet long, and of the shape and thickness the whole is to be; this is then sent to the chafery, and there the ends are wrought to the shape of the middle, and the whole made into a bar. See Bar.

ANCORARUM URBS, Ανκυρων Πολις, a city in the Nomos Aphroditopolites, towards the Red Sea; so called because there was in the neighbourhood a stone quarry, in which they hewed stone anchors (Ptolemy) before iron anchors came to be used. The gentilitious name is *Ancyropolites*, (Stephanus).

ANCOURT (Florent-Cartond'), an eminent French actor and dramatic writer, born at Fontainbleau, October 1661. He studied in the Jesuits college at Paris, under father de la Rue; who, discovering in him a remarkable vivacity and capacity for learning, was extremely desirous of engaging him in their order; but Ancourt's aversion to a religious life rendered all his efforts ineffectual. After he had gone through a course of philosophy, he applied himself to the civil law, and was admitted advocate at 17 years of age. But falling in love with an actress, he was induced to go upon the stage, and he married her. As he had all the qualifications necessary for the theatre, he soon greatly distinguished himself: and not being satisfied with the applause only of an actor, he began to write pieces for the stage; many of which had such prodigious success, that most of the players grew rich from the profits of them. His merit in this way procured him a very favourable reception at court; and Lewis XIV. showed him many marks of his favour. His sprightly conversation and polite behaviour made his company agreeable to all the men of figure both at court and in the city, and the most considerable persons were extremely pleased to have him at their houses Having taken a journey to Dunkirk, to see his eldest daughter who lived there, he took the opportunity of paying his compliments to the elector of Bavaria, who was then at Brussels: this prince received him with the utmost civility; and having detained him a considerable time, dismissed him with a present of a diamond valued at 1000 pistoles: he likewise rewarded him in a very generous manner, when, upon his coming to Paris, Ancourt composed an entertainment for his diversion. Ancourt began at length to grow weary of the theatre, which he quitted in Lent 1718, and retired to his estate of Courcelles le Roy, in Berry, where he applied himself wholly to devotion, and composed a translation of David's Psalms in verse, and a sacred tragedy, which were never printed. He died the 6th of December, 1726, being 65 years of age.—The plays which he wrote are 52 in all; most of which were printed separately at the time when they were first represented: they were afterwards collected into five volumes, then into seven, and at last into nine. This last edition is the most complete.

ANCRE, a small town of France, in Picardy, with the title of a marquisate, seated on a little river of the same name. E. Long. 2. 45. N. Lat. 49. 59.

ANCUS MARTIUS, the fourth king of the Romans, succeeded by Tullius Hostilius, 639 years before Christ. He defeated the Latins, subdued the Fidenates, conquered the Sabines, Volscii, and Veientines, enlarged Rome by joining to it mount Janicula, and made the harbour of Ostia. He died about 615 years before the Christian æra.

ANCYLE, in antiquity, a kind of shield that fell, as was pretended, from heaven, in the reign of Numa Pompilius; at which time, likewise, a voice was heard declaring that Rome should be mistress of the world as long as she should preserve this holy buckler. It was kept with great care in the temple of Mars, under the direction of twelve priests; and lest any should attempt to steal it, eleven others were made so like, as not to be distinguished from the sacred one. These ancylia were carried in procession every year round the city of Rome.

Ancyle, in surgery. See Ancylosis.

ANCYLOBLEPHARON, (from αγκυλ☉ *bent*, and βλεφαρον *an eye-lid*); a disease of the eye, which closes the eye-lids. Sometimes the eye-lids grow together, and also to the tunica albuginea of the eye, from carelessness when there is an ulcer in these parts. Both these cases are called *ancyloblepharon* by the Greeks. This disorder must be distinguished from that coalition of the eye-lids which happens from viscid matter gluing them together. If the cohesion is on the cornea, the sight is inevitably lost. This hath sometimes happened in the small-pox. If there is only a growing together of the eye-lids, they may be separated with the specillum, and pledgets kept between them to prevent their re-union. If the eye-lids adhere to the eye, they are to be separated by a fine-edged knife; and their re-union is to be prevented by a proper use of injections, and lint placed between them, after dipping it in some proper liniment.

ANCYLOGLOSSUM, from αγκυλος *crooked*, and γλωσσα *the tongue*); a contraction of the ligaments of the tongue. Some have this imperfection from their birth, others from some disease. In the first case, the membrane which supports the tongue is too short or too hard: in the latter, an ulcer under the tongue, healing and forming a cicatrix, is sometimes the cause: These speak with some difficulty. The ancyloglossi by nature are late before they speak; but when they begin, they soon speak properly. These we call *tongue-tied*. Mauriceau says, that in this case it is a small membranous production, which extends from the frænulum to the tip of the tongue, that hinders the child from sucking, &c. He justly condemns the cruel practice among nurses, of tearing this membrane with their nails; for thus ulcers are sometimes formed, which are

of difficult cure: he advifes to fnip it with fciffars in two or three places, taking care not to extend the points of the fciffars fo far as the frænulum. The inftances rarely occur which require any kind of affiftance; for if the child can thruft the tip of its tongue to the outer edge of its lip, this difeafe does not exift; and if the tongue is not greatly reftrained, the frænulum will ftretch by the child's fucking and crying.

ANCYLOSIS, in furgery, implies a diftortion or ftiffnefs of the joints, caufed by a fettlement of the humours, or a diftenfion of the nerves, and therefore remedies of a mollifying and relaxing nature are required.

ANCYRA, the capital of Galatia, (Livy, Pliny, Ptolemy); at no great diftance from the river Halys, (Livy): faid to be built by Midas, king of Phrygia, and to take its name from an anchor found there, (Paufanias). It was greatly improved by Auguftus, deemed the fecond founder of it, as appears from the *Marmor Ancyranum.* It is now called *Angura*, or *Angoura.* E. Long. 33°. Lat. 41. 20.

ANCYSTRUM, in botany: A genus of the digynia order, belonging to the diandria clafs of plants; the effential characters of which are: The *calyx* is a fingle-leaved, four-toothed perianthium, four-awn'd, the awns terminated with crofs-barbs: The *corolla* is four-cleft; the ftigma pencil'd.

ANDABATÆ, in antiquity, a fort of gladiators, who, mounted on horfeback or in chariots, fought hoodwinked, having a helmet that covered their eyes.

ANDALUSIA, is the moft weftern province of Spain, having Eftremadura and La Mancha on the north; the kingdom of Granada, the ftraits of Gibraltar, and the Ocean, on the eaft and fouth; and, on the weft, the kingdom of Algarva in Portugal, from which it is feparated by the river Guadiana. It is about 182 miles long, and 150 broad. The chief cities and towns are Seville the capital, Baeza, Gibraltar, Corduba, Cadiz, Medina Sidonia, Jaen, Port St Mary, &c. It is the beft, moft fruitful, and the richeft part of all Spain. There is a good air, a ferene fky, a fertile foil, and a great extent on the fea-coaft fit for commerce.

New Andalusia, a divifion of the province of Terra Firma in South America, whofe boundaries cannot be well afcertained, as the Spaniards pretend a right to countries in which they have never eftablifhed any fettlements. According to the moft reafonable limits, it extends in length 500 miles from north to fouth, and about 270 in breadth from eaft to weft. The interior country is woody and mountainous, variegated with fine valleys that yield corn and pafturage. The produce of the country confifts chiefly in dying-drugs, gums, medicinal roots, brazil wood, fugar, tobacco, and fome valuable timber. To this province alfo belonged five valuable pearl-fifheries. The capital of New Andalufia is Comana, Cumana, or New Corduba, fituated in N. Lat. 9. 55. about nine miles from the north fea. Here the Spaniards laid the foundation of a town in the year 1520. The place is ftrong by nature, and fortified by a caftle capable of making a vigorous defence; as appeared in the year 1670, when it was affaulted by the bucaneers, who were repulfed with very great flaughter.

ANDAMAN or ANDEMAN Iflands, in the Eaft Indies, fituated about 80 leagues diftance from Tanaf-

ferim on the coaft of Siam. They are but little known; only the Eaft India fhips fometimes touch at them, and are fupplied by the natives with rice, herbs, and fruits: the inhabitants are by fome reprefented as an harmlefs inoffenfive race of men, and by others as cannibals. E. Long. 92. 0. N. Lat. from 10°. to 15°.

ANDANTE, in mufic, fignifies a movement moderately flow, between *largo* and *allegro.*

ANDECAVI, (Tacitus); ANDEGAVI, (Pliny); ANDES, (Cæfar); ANDI, (Lucan): A people of Gallia Celtica, having the Turones to the eaft, the Namnetes to the weft, the Pictones to the fouth, and the Aulerci Cœnomani to the north: now *Anjou.*

ANDEGAVI, or ANDEGAVUS, a town of Gallia Celtica, (Pliny, Ptolemy); now *Angiers.* Called *Andecavi*, (Tacitus). W. Long. 30. Lat. 47. 30.

ANDELY, a town of Normandy in France, parted in two by a paved caufeway. Here is a fountain to which pilgrims flock from all parts, to be cured of their diforders, on the feaft-day of the faint to which it is dedicated. It is 20 miles S. E. of Rouen, and five N. W. of Paris. E. Long. 1. 30. N. Lat. 49. 20.

ANDENA, in old writers, denotes the fwath made in mowing of hay, or as much ground as a man could ftride over at once.

ANDEOL (St), a town of France, in the Vivarez, five miles S. of St Viviers, whofe bifhop formerly refided there. E. Long. 2. 50. N. Lat. 44. 24.

ANDERAB, the moft fouthern city of the province of Balkh, poffeffed by the Ufbeck Tartars. It is very rich and populous, but a place of no great ftrength. The neighbouring mountains yield excellent quarries of lapis lazuli, in which the Bukhars drive a great trade with Perfia and India.—This city is fituated at the foot of the mountains dividing the dominions of the Great Mogul and Perfia from Great Bukharia. As there is no other way of croffing thefe mountains but by the road through this city, all travellers with goods muft pay 4 per cent. On this account the Khan of Balkh maintains a good number of foldiers in the place.

ANDERNACHT, a city of Cologne, in the circle of the Lower Rhine. It is fituated in a plain on the river Rhine; and is fortified with a wall, caftle, and bulwarks. It has a trade in ftone jugs and pitchers, which are fent to the mineral waters at Dunchftein. There are three monafteries here, and feveral churches. E. Long. 7. 4. N. Lat. 50. 27.

ANDERO (St), a fea-port town in the bay of Bifcay, in Old Caftile, feated on a fmall peninfula. It is a trading town, and contains about 700 houfes, two parifh-churches, and four monafteries. Here the Spaniards build and lay up fome of their men of war. W. Long. 4. 30. N. Lat. 43. 20.

ANDERSON (Sir Edmund), a younger fon of an ancient Scotch family fettled in Lincolnfhire. He was fome time a ftudent of Lincoln college, Oxford; and removed from thence to the Inner Temple, where he applied himfelf diligently to the ftudy of the law, and became a barrifter. In the 9th of queen Elizabeth he was both lent and fummer reader, and in the 16th double reader. He was appointed her majefty's ferjeant at law in the 19th year of her reign; and fome time after, one of the juftices of affize. In 1582 he

Anderfon, Andes.

was made lord chief juftice of the common pleas, and in the year following was knighted. He held his office to the end of his life, died in the year 1605, and was buried at Eyworth in Bedfordfhire. He was an able, but punctilious lawyer; a fcourge to the Puritans; and a ftrenuous fupporter of the eftablifhed church. His works are, 1. Reports of many principal cafes argued and adjudged in the time of queen Elizabeth, in the common bench. Lond. 1644, fol. 2. Refolutions and judgments on the cafes and matters agitated in all the courts of Weftminfter, in the latter end of the reign of queen Elizabeth. Publifhed by John Goldfborough, Efq; Lond. 1653, 4to. Befides thefe, there is a manufcript copy of his Readings ftill in being.

Anderson (Adam), a native of Scotland, was brother to the reverend James Anderfon, D. D. editor of the *Diplomata Scotiæ* and *Royal Genealogies*, many years fince minifter of the Scots Prefbyterian church in Swallow ftreet, Piccadilly, and well known in thofe days among the people of that perfuafion refident in London by the name of Bifhop Anderfon, a learned but imprudent man, who loft a confiderable part of his property in the fatal year 1720. He married, and had iffue a fon, and a daughter who was the wife of an officer in the army.

Adam Anderfon was for 40 years a clerk in the South Sea Houfe; and at length arrived to his acmè there, being appointed chief clerk of the Stock and and New Annuities, which office he retained till his death. He was appointed one of the truftees for eftablifhing the colony of Georgia in America; and was alfo one of the court of affiftants of the Scots corporation in London. The time of the publication of his "Hiftorical and Chronological Deduction of Trade and Commerce," a work replete with ufeful information, was about the year 1762. He was twice married; by the firft wife he had iffue a daughter, married to one Mr Hardy, an apothecary in the Strand, who are both dead without iffue; he afterwards became the third hufband of the widow of Mr Coulter, formerly a wholefale linen-draper in Corn-hill, by whom he had no iffue. She was, like him, tall and graceful; and her face has been thought to have fome refemblance to that of the ever-living countefs of Defmond, given in Mr Pennant's firft Tour in Scotland. Mr Anderfon died at his houfe in Red Lion ftreet, Clerkenwell, January 10. 1775. He had a good library of books, which were fold by his widow, who furvived him feveral years, and died in 1781.

ANDES, a great chain of mountains in South America, which running from the moft northern part of Peru to the ftraits of Magellan, between 3 and 4000 miles, are the longeft and moft remarkable in the world. The Spaniards call them the *Cordillera de los Andes;* they form two ridges, the lowermoft of which is overfpread with woods and groves, and the uppermoft covered with everlafting fnow. Thofe who have been at the top, affirm, that the fky is always ferene and bright; the air cold and piercing; and yet fo thin, that they were fcarce able to breath, and the refpiration was much quicker than ordinary; and this is attended with reaching and vomiting; which, however, has been confidered by fome as merely accidental. When they looked downwards, the country was hid by the clouds that hovered on the mountain's fides. The mountains juft mentioned, which have been frequently afcended, are much inferior in height to many others in this enormous chain. The following is the account given of the mountain called *Pichincha*, by the mathematicians fent by the kings of France and Spain to make obfervations in relation to the figure of the earth.

Andes.

Soon after our artifts arrived at Quito, they determined to continue the feries of the triangles for meafuring an arch of the meridian to the S. of that city: the company accordingly divided themfelves into two bodies, confifting of French and Spaniards, and each retired to the part affigned them. Don George Juan and M. Godin, who were at the head of one party, went to the mountain of Pambamarca; while M. Bougeur, de la Condamine, and Don Ulloa, together with their affiftants, climbed up to the higheft fummit of Pichincha. Both parties fuffered extremely, as well from the feverity of the cold as from the impetuofity of the winds, which on thefe heights blow with inceffant violence; difficulties the more painful, as they had been little ufed to fuch fenfations. Thus in the torrid zone, nearly under the equinoctial, where it is natural to fuppofe they had moft to fear from the heat, their greateft pain was caufed by the exceffivenefs of the cold.

Their firft fcheme for fhelter and lodging in thefe uncomfortable regions, was to pitch a field-tent for each company; but on Pichincha this could not be done from the narrownefs of the fummit: they were therefore obliged to be contented with a hut fo fmall that they could hardly all creep into it. Nor will this appear ftrange, if the reader confiders the bad difpofition and fmallnefs of the place, it being one of the loftieft crags of a rocky mountain, 100 fathoms above the higheft part of the defart of Pichincha. Such was the fituation of their manfion, which, like all the other adjacent parts, foon became covered with ice and fnow. The afcent up this ftupendous rock, from the bafe, or the place where the mules could come, to their habitation, was fo craggy as only to be climbed on foot; and to perform it coft them four hours continual labour and pain, from the violent efforts of the body, and the fubtility of the air; the latter being fuch as to render refpiration difficult.

The ftrange manner of living to which our artifts were reduced during the time they were employed in a geometrical menfuration of fome degrees of the meridian, may not perhaps prove unentertaining to the reader; and therefore the following account is given as a fpecimen of it. The defart of Pichincha, both with regard to the operations performed there and its inconveniences, differing very little from others, an idea may be very eafily formed of the fatigues, hardfhips, and dangers, to which they were continually expofed during the time they were profecuting the enterprife, with the conduct of which they had been honoured. The principal difference between the feveral defarts confifted in their greater or leffer diftance from places where they could procure provifions; and in the inclemency of the weather, which was proportionate to the height of the mountains, and the feafon of the year.

They generally kept within their hut. Indeed they were obliged to do this, both on account of the intenfenefs

Andes.

tenfenefs of the cold, the violence of the wind, and their being continually involved in fo thick a fog, that an object at fix or eight paces was hardly difcernible. When the fog cleared up, the clouds by their gravity moved nearer to the furface of the earth, and on all fides furrounded the mountains to a vaft diftance, reprefenting the fea, with their rock like an ifland in the centre of it. When this happened, they heard the horrid noifes of the tempefts, which then difcharged themfelves on Quito and the neighbouring country. They faw the lightenings iffue from the clouds, and heard the thunders roll far beneath them: and whilft the lower parts were involved in tempefts of thunder and rain, they enjoyed a delightful ferenity; the wind was abated, the fky clear, and the enlivening rays of the fun moderated the feverity of the cold. But their circumftances were very different when the clouds rofe: their thicknefs rendered refpiration difficult; the fnow and hail fell continually; and the wind returned with all its violence; fo that it was impoffible entirely to overcome the fears of being, together with their hut, blown down the precipice, on whofe edge it was built, or of being buried under it by the daily accumulations of ice and fnow.

The wind was often fo violent in thefe regions, that its velocity dazzled the fight, whilft their fears were increafed from the dreadful concuffions of the precipice, caufed by the fall of enormous fragments of rocks. Thefe crufhes were the more alarming, as no other noifes are heard in thefe defarts: and during the night, their reft, which they fo greatly wanted, was frequently difturbed by fuch fudden founds. When the weather was any thing fair with them, and the clouds gathered about fome of the other mountains which had a connection with their obfervations, fo that they could not make all the ufe they defired of this interval of good weather, they left their hut to exercife themfelves. Sometimes they defcended to fome fmall diftance; and at others, amufed themfelves with rolling large fragments of rocks down the precipice; and thefe frequently required the joint ftrength of them all, though they often faw the fame effected by the mere force of the wind. But they always took care in their excurfions not to go fo far out, but that on the leaft appearance of the clouds gathering about their cottage, which often happened very fuddenly, they could regain their fhelter. The door of their hut was faftened with thongs of leather, and on the infide not the fmalleft crevice was left unftopped; befide which, it was very compactly covered with ftraw: but, notwithftanding all their care, the wind penetrated through. The days were often little better than the nights; and all the light they enjoyed was that of a lamp or two, which they kept continually burning.

Though their hut was fmall, and crowded with inhabitants, befide the heat of the lamps; yet the intenfenefs of the cold was fuch, that every one of them was obliged to have a chafing difh of coals. Thefe precautions would have rendered the rigour of the climate fupportable, had not the imminent danger of perifhing by being blown down the precipice roufed them, every time it fnowed, to encounter the feverity of the outward air, and fally out with fhovels to free the roof of their hut from the maffes of fnow which were gathering on it. Nor would it, without this precaution, have been able to fupport the weight. They were not indeed without fervants and Indians; but thefe were fo benumbed with the cold, that it was with great difficulty they could get them out of a fmall tent, where they kept a continual fire. So that all our artifts could obtain from them was to take their turns in this labour; and even then they went very unwillingly about it, and confequently performed it flowly.

It may eafily be conceived what this company fuffered from the afperities of fuch a climate. Their feet were fwelled; and fo tender, that they could not even bear the heat; and walking was attended with extreme pain. Their hands were covered with chilblains; their lips fwelled and chopped; fo that every motion in fpeaking, or the like, drew blood; confequently they were obliged to ftrict taciturnity, and little difpofed to laugh, as, by caufing an extenfion of the lips, it produced fuch fiffures as were very painful for two or three days after.

Their common food in this inhofpital region was a little rice boiled with fome flefh or fowl, procured from Quito; and, inftead of fluid water, their pot was filled with ice; they had the fame refource with regard to what they drank; and while they were eating, every one was obliged to keep his plate over a chafing-difh of coals, to prevent his provifions from freezing. The fame was done with regard to the water. At firft they imagined the drinking ftrong liquors would diffufe a heat through the body, and confequently render it lefs fenfible of the painful fharpnefs of the cold; but, to their furprife, they felt no manner of ftrength in fuch liquors, nor were they any greater prefervative againft the cold than the common water.

At the fame time, they found it impoffible to keep the Indians together. On their firft feeling of the climate, their thoughts were immediately turned on deferting their mafters. The firft inftance they had of this kind was fo unexpected, that, had not one, of a better difpofition than the reft, ftaid and acquainted them of their defign, it might have proved of very bad confequence. The affair was this: There being on the top of the rock no room for pitching a tent for the Indians, they ufed every evening to retire to a cave at the foot of the mountain; where, befide a natural diminution of the cold, they could keep a continual fire; and, confequently, enjoyed more comfortable quarters than their mafters. Before they withdrew at night, they faftened, on the outfide, the door of the hut, which was fo low that it was impoffible to go in or out without ftooping; and as every night the hail and fnow which had fallen formed a wall againft the door, it was the bufinefs of one or two of the Indians to come early and remove this obftruction. For though the negro fervants were lodged in a little tent, their hands and feet were fo covered with chilblains, that they would rather have fuffered themfelves to have been killed than move. The Indians therefore came conftantly up to difpatch this work betwixt nine or ten in the morning: but they had not been there above four or five days, when they were not a little alarmed to fee ten, eleven, and twelve o'clock come, without any news of their labourers; when they were relieved by the honeft fervant mentioned above, who had withftood the feduction of his countrymen, and informed his mafters of the defertion of the four others. As foon as the fnow was cleared away from the

the door, they dispatched the Indian to the corregidor of Quito, who with equal dispatch sent other Indians, threatening to chastise them severely if they were wanting in their duty.

But the fear of punishment was not sufficient to induce them to support the rigour of this situation; for within two days they deserted. The corregidor therefore, to prevent any other inconvenience, sent four Indians under the care of an alcalde, and gave orders for their being relieved every fourth day.

Twenty-three tedious days our artists spent on this rock, viz. to the 6th of September, and even without any possibility of finishing their observations of the angles: for when it was fair and clear weather with them, the others, on whose summits the signals which formed the triangles for measuring the degrees of the meridian, were hid in the clouds; and when those were clear, Pichincha was involved in clouds. It was therefore necessary to erect their signals in a lower situation, and in a more favourable region. This, however, did not produce any change in their habitation till the beginning of December; when, having finished the observations which particularly concerned Pichincha, they proceeded to others; but with no abatement either of inconveniences, cold, or fatigue; for the places where they made their observations being necessarily on the highest parts of the desarts, the only respite in which they enjoyed some little ease was during the short interval of passing from one to the other.

In all their stations subsequent to that on Pichincha, during their fatiguing mensuration of the degrees of the meridian, each company lodged in a field-tent, which, though small, they found less inconvenient than the hut on Pichincha; though at the same time they had more trouble, being oftener obliged to clear it from the snow, as the weight of it would otherwise have demolished the tent. At first, indeed, they pitched it in the most sheltered places; but on taking a resolution that the tents themselves should serve for signals, to prevent the inconvenience of having others of wood, they removed them to a more exposed situation, where the impetuosity of the winds sometimes tore up the piquets, and blew them down.

Though this mountain is famous for its great height, it is considerably lower than the mountain of Cotopaxi: but it is impossible to conceive the coldness of the summit of the last-mentioned mountain from that felt on this; since it must exceed every idea that can be formed by the human mind, tho' they are both seated in the midst of the torrid zone. In all this range of mountains, there is said to be a constant inferior boundary, beyond which the snow never melts: this boundary, in the midst of the torrid zone, is said by some to be 2434 fathoms above the level of the sea; by others, only 2400 feet. The snow indeed falls much lower, but then it is subject to be melted the very same day. It is affirmed, that there are in the Andes 16 volcanoes or burning mountains, which throw out fire and smoke with a terrible noise. The height of Chimborazo, said to be the highest peak of the Andes, has been determined by geometrical calculations to be 20,282 feet. But the great differences between the calculators of the height of mountains in other parts of the world, must very much diminish the credit of such calculations. Instances of this we have already given under the article ÆTNA. No less remarkable are the differences concerning the height of the peak of Teneriffe; which, according to the calculations of Varenius, is three miles and three quarters, or 19,800 feet; according to those of Dr Heberden, it is only 15,396 feet; and according to those of M. Feuille, is no more than 13,128 feet. From these specimens, we can scarce avoid concluding, that all the methods hitherto invented for calculating the exact height of mountains are insufficient.

As all or most rivers have their source in mountains, it is no wonder a great number run down the sides of the Andes. Some hurry along with a prodigious rapidity; while others form beautiful cascades, or run thro' holes in rocks, which look like bridges of a stupendous height. There is a public road through the mountains, 1000 miles in length, part of which runs from Quito to Cusco.

ANDES, a hamlet of Mantua in Italy, the birthplace of Virgil. Hence the epithet *Andinus* (Silius Italicus). Now called *Pietola*, two miles to the west of Mantua.

ANDETRIUM; ANDRETIUM (Strabo); ANDECRIUM, or ANDRECIUM (Ptolemy): An inland town of Dalmatia. The genuine name is *Andetrium* (Inscription). It is described as situated near Salonæ, on a naturally strong and inaccessible rock, surrounded with deep valleys, with rapid torrents; from which it appears to be the citadel now called *Clissa*. E. Long. 17. 46. Lat. 43. 20.

ANDEUSE, a city of Languedoc in France, situated in E. Long. 3. 40. and N. Lat. 43. 45.

ANDOMADUNUM; ANDOMATUNUM (Ptolemy); and ANTEMATUNUM (Antonine); CIVITAS LINGONUM (Tacitus): A city of Gallia Belgica; now *Langres* in Champagne, situated on an eminence (which seems to justify the termination *dunum*), on the borders of Burgundy, at the springs of the Marne. Tacitus calls an inhabitant *Lingon*. E. Long. 5. 22. N. Lat. 48. 0.

ANDOVER, a large market-town in Hampshire, on the London road. It is seated on a branch of the river Test, and sends two members to parliament. It has several inns, which afford good accommodation for travellers; and has a market on Saturday, well stocked with provisions. It is governed by a bailiff, a steward, a recorder, ten approved men, and twenty-two capital burgesses, who yearly choose the bailiff, and he elects two serjeants at mace to attend him. The living is a vicarage, valued at 171 l. 4s. 4d. in the king's books. W. Long. 0. 56. N. Lat. 51. 20.

ANDRADA (Diego de Payva d'), or ANDRADIUS, a learned Portuguese, born at Conimbria, who distinguished himself at the council of Trent, where king Sebastian sent him as one of his divines. There is scarce any Catholic author who has been more quoted by the Protestants than he, because he maintained some opinions a little extravagant concerning the salvation of the Heathens. Andrada was esteemed an excellent preacher. His sermons were published in three parts, the second of which was translated into Spanish by Benedict de Alcoran. Many encomiums have been bestowed upon Andrada. Osorius, in his preface to the "Orthodox Explanations of Andradius," gives him the character of a man of wit, vast application, great knowledge in the languages, with all the

zeal and eloquence neceffary to a good preacher; and Rofweidus fays, that he brought to the council of Trent the underftanding of a moft profound divine, and the eloquence of a confummate orator.

ANDRACHNE, Bastard Orpine: A genus of the gynandria order, belonging to the monœcia clafs of plants; and in the natural method ranking under the 38th order, *Tricoccæ*. The characters are: The male *calyx* confifts of five leaves; the *corolla* has five petals; and the *ftamina*, which are alfo five in number, are inferted into the ftylus: The female *calyx* is divided into five leaves; there is no *corolla;* the *ftyli* are three; and the *capfule* is trilocular, containing three feeds.

Species. 1. The telephoides, or herbaceous trailing andrachne, is a low plant, whofe branches trail upon the ground. The leaves are fmall, of an oval fhape, fmooth, and of a fea-green colour. It is found wild in fome parts of Italy and the Archipelago; but is a plant of no great beauty, and therefore feldom cultivated. 2. The fruticofa, or fhrubby baftard orpine, is a native of China and fome places of America, where it rifes 12 or 14 feet high. The leaves are fpear-fhaped, pointed, and fmooth; and under them are produced the footftalks of the flowers, which are fmall, and of a herbaceous white colour. 3. The arborea, with a tree-like ftalk. This fpecies was difcovered by the late Dr William Houfton, growing naturally at Campeachy. It has a ftrong woody ftem, which rifes more than 20 feet high, and fends out many branches on every fide. This has not yet flowered in Britain. A fourth fort is alfo mentioned by Mr Millar as raifed by him from feeds fent from Jamaica. It agrees in general with the third fort; but the leaves are fomewhat like the laurel, only much larger.

Culture. The firft fpecies may be raifed, by fowing the feeds in March, on a moderate hot-bed. The plants may be removed into fmall pots, and plunged into another very moderate hot-bed, to bring them forward; but in mild weather they fhould have plenty of air admitted to them, and be frequently refrefhed with water. In June they will produce flowers, and the feeds will ripen in Auguft and September.—The other fpecies are very tender, and therefore muft be kept conftantly in the bark-ftove. It is very difficult to procure good feeds of thefe forts; the covers often containing nothing, though they appear very fair outwardly. Of all the feeds fent over by Dr Houfton, only one was found to contain a kernel, fo that only one plant was produced.

ANDRAPODISMUS, in ancient writers, the felling of perfons for flaves. Hence alfo *andrapodiftes*, a dealer in flaves, more particularly a kidnapper, who fteals men or children to fell them; a crime for which the Theffalians were noted.

ANDRAPODOCAPELI, in antiquity, a kind of dealers in flaves. The *andracodocapeli* had a particular procefs for taking off moles and the like disfigurements on the faces of the flaves they kept for fale, by rubbing them with bran. At Athens, feveral places in the forum were appointed for the fale of flaves. Upon the firft day of every month, the merchants called Ανδραποδοκαπηλοι brought them into the market, and expofed them to fale; the crier ftanding upon a ftone erected for that purpofe, called the people together.

ANDREA (St), a fmall village on the Malabar coaft in the Eaft Indies, founded originally by the Portuguefe. It takes its name from a church dedicated to St Andrew, and ferved by the priefts of St Thomas.—On the fhore of St Andrea, about half a league out in the fea, lies Mud-bay, a place which few in the world can parallel. It is open to the wide ocean, and has neither ifland nor bank to break the force of the billows, which come rolling with great violence from all parts, in the fouth-weft monfoons: but on this bank of mud they lofe themfelves in a moment; and fhips lie on it as fecure as in the beft harbour, without motion or difturbance. It reaches about a mile along fhore, and has been obferved to fhift its place from the northward about three miles in 30 years. From St Andrea to Kranganôr, about 12 leagues to the fouth, the water has the bad property of caufing fwellings in the legs of thofe who drink it conftantly. Some it affects in one leg, and fome in both. It caufes no pain, but itching; nor does the fwelled leg feem heavier to the owner than the fmall one, though fome have been feen a yard in circumference at the ancle. The Romifh legends impute the caufe of this diftemper (for which no preventative or cure hath been hitherto found) to a curfe laid by St Thomas upon his murderers and their pofterity; though, according to the Romans themfelves, St Thomas was killed by the Tillinga priefts at Meliaphûr, on the coaft of Coromandel, about 400 miles diftant, and where the natives have not this diftemper.

ANDREAS (John), a celebrated canonift in the 14th century, was born at Mugello, near Florence; and was profeffor of canon-law at Padua, Pifa, and afterwards at Bologna. It is faid that he macerated his body with fafting; and lay upon the bare ground every night for 20 years together, covered only with the fkin of a bear. This is attefted by very good authors; but if the ftory which Poggius tells of him in his Jefts be true, he muft afterwards have relaxed much of this continency: "Joannem Andream, (fays he), doctorem Bononienfem, cujus fama admodum vulgata eft, fubagitantem ancillam domefticam uxor deprehendit: re infueta ftupefacta mulier in virum verfa, Ubi nunc, ait, Joannes, eft fapientia veftra? ille nil amplius locutus, In vulva iftius, refpondit, loco admodum fapientiæ accommodato." The French tranflation of this perhaps will not be difpleafing.

Jean, dit André, fameux Docteur des Loix,
Fut pris un jour au péché d'amourette:
Il acolloit une jeune foubrette.
Sa femme vint, fit un figne de croix.
Ho ho, dit elle, eft ce vous? non je penfe:
Vous, dont par tout on vante la prudence.
Qu'eft devenu cet efprit fi fubtil?
Le bon André, pour fuivant fon négoce,
Honteux pourtant, ma foi, répondit-il,
Prudence, efprit, tout gift dans cette foffe.

Since it is agreed that John Andreas had a baftard, this ftory is at the bottom very probable; and it was perhaps with the mother of Banicontius that his wife found him. Andreas had a beautiful daughter, named *Novella*, whom he loved extremely: and he is faid to have inftructed her fo well in all parts of learning, that when he was engaged in any affair which hindered him from reading lectures to his fcholars, he fent his daughter in his room; and left her beauty fhould prevent the at-

attention of the hearers, ſhe had a little curtain drawn before her. To perpetuate the memory of this daughter, he intitled his commentary upon the Decretals of Gregory IX. the *Novellæ*. He married her to John Calderinus, a learned canoniſt. The firſt work of Andreas was his Gloſs upon the Sixth Book of the Decretals, which he wrote when he was very young. He wrote alſo Gloſſes upon the Clementines; and a Commentary *in regulas Sexti*, which he intitled *Mercuriales*, becauſe he either engaged in it on Wedneſdays (*diebus Mercurii*,) or becauſe he inſerted his Wedneſdays diſputes in it. He enlarged the Speculum of Durant, in the year 1347. This is all which Mr Bayle mentions of his writings, though he wrote many more. Andreas died of the plague at Bologna, in 1348, after he had been a profeſſor 45 years; and was buried in the church of the Dominicans. Many eulogiums have been beſtowed upon him. He has been called *Archidoctor decretorum*: In his epitaph, *Rabbi doctorum; lux, cenſor normaque morum*; "Rabbi of the doctors, the light, cenſor, and rule of manners:" And it is ſaid, that Pope Boniface called him *lumen mundi*, "the light of the world."

Andreas (John) was born a Mahometan, at Xativa in the kingdom of Valencia, and ſucceeded his father in the dignity of alſaqui of that city. He was enlightened with the knowledge of the Chriſtian religion by being preſent at a ſermon in the great church of Valencia on the day of Aſſumption of the bleſſed Virgin, in the year 1487. Upon this he deſired to be baptized; and, in memory of the calling of St John and St Andrew, he received the name John Andreas. "Having received holy orders (ſays he), and, from an alfaqui and a ſlave of Lucifer, become a prieſt and miniſter of Chriſt; I began, like St Paul, to preach and publiſh the contrary of what I had erroneouſly believed and aſſerted; and, with the aſſiſtance of Almighty God, I converted at firſt a great many ſouls of the Moors, who were in danger of hell, and under the dominion of Lucifer, and conducted them into the way of ſalvation. After this, I was ſent for by the moſt catholic princes king Ferdinand and queen Iſabella, in order to preach in Granada to the Moors of that kingdom, which their majeſties had conquered: by God's bleſſing on my preaching, an infinite number of Moors were brought to abjure Mahomet, and to turn to Chriſt. A little after this, I was made a canon by their grace; and ſent for again by the moſt Chriſtian queen Iſabella to Arragon, that I might be employed in the converſion of the Moors of thoſe kingdoms, who ſtill perſiſted in their errors, to the great contempt and diſhonour of our crucified Saviour, and the prodigious loſs and danger of all Chriſtian princes. But this excellent and pious deſign of her Majeſty was rendered ineffectual by her death." At the deſire of Martin Garcia, biſhop of Barcelona, he undertook to tranſlate from the Arabic, into the language of Arragon, the whole law of the Moors; and after having finiſhed this undertaking, he compoſed his famous work of *The Confuſion of the Sect of Mahumed*: it contains twelve chapters, wherein he has collected the fabulous ſtories, impoſtures, forgeries, brutalities, follies, obſcenities, abſurdities, impoſſibilities, lies, and contradictions, which Mahomet, in order to deceive the ſimple people, has diſperſed in the writings of that ſect, and eſpecially in the alcoran, which, as he ſays, was revealed to him in one night by an angel, in the city of Meke; though in another place he contradicts himſelf, and affirms that he was 20 years in compoſing it. Andreas tells us, he wrote this work, that not only the learned amongſt Chriſtians, but even the common people, might know the different belief and doctrine of the Moors; and on the one hand might laugh and ridicule ſuch inſolent and brutal notions, and on the other might lament their blindneſs and dangerous condition. This book, which was publiſhed at firſt in Spaniſh, has been tranſlated into ſeveral languages; all thoſe who write againſt the Mahometans quote it very much.

ANDREINI (Iſabella), a native of Padua, was an excellent poeteſs, and one of the beſt comedians in Italy, towards the beginning of the 17th century. The Intenti of Pavia thought they did their ſociety an honour by admitting her a member of it; and ſhe, in acknowledgment of this honour, never forgot to mention amongſt her titles that of *Academica Infanta*: her titles were theſe, "Iſabella Andreini, comica geloſa, academica inſanta, detta l'acceſſa." She was alſo a woman of extraordinary beauty; which, added to a fine voice, made her charm both the eyes and ears of the audience. She died of a miſcarriage, at Lyons, the 10th of June, 1604, in the 42d year of her age. Her death being a matter of general concern and lamentation, there were many Latin and Italian elegies printed to her memory: ſeveral of theſe pieces were placed before her poems in the edition of Milan, in 1605. Beſides her ſonnets, madrigals, ſongs, and eclogues, there is a paſtoral of hers intitled Myrtilla, and letters, printed at Venice in 1610. She ſung extremely well, played admirably on ſeveral inſtruments, underſtood the French and Spaniſh languages, and was not unacquainted with philoſophy.

ANDRELINUS (Publius Fauſtus), born at Forli in Italy. He was a long time profeſſor of poetry and philoſophy in the univerſity of Paris. Lewis XII. of France made him his poet laureat; and Eraſmus tells us he was likewiſe poet to the queen. His pen was not wholly employed in making verſes; for he wrote alſo moral and proverbial letters in proſe, which were printed ſeveral times. His poems, which are chiefly in Latin, are inſerted in Vol. I. of the *Deliciæ Poetarum Italorum*. Mr De la Monnoie tells us, "that Andrelinus, when he was but 22 years old, received the crown of laurel: That his love-verſes, divided into four books, intitled *Livia*, from the name of his miſtreſs, were eſteemed ſo fine by the Roman Academy, that they adjudged the prize of the Latin elegy to the author." He died in 1518. This author's manner of life was not very exemplary; yet he was ſo fortunate, ſays Eraſmus, that though he took the liberty of rallying the divines, he was never brought into trouble about it.

ANDREW (St), the apoſtle, born at Bethſaida in Galilee, brother to Simon Peter. He had been a diſciple of John the baptiſt, and followed Jeſus upon the teſtimony given of him by the baptiſt, (John i. 30, 37, &c.) He followed our Saviour with another of John's diſciples, and went into the houſe where Jeſus lodged; here he continued from about four o'clock in the afternoon till it was night. This was the firſt diſciple whom our Saviour received into his train. Andrew introduced his brother Simon, and they paſſed a day

with

with Chriſt, after which they went to the marriage in Cana (*id.* ii.), and at laſt returned to their ordinary occupation. Some months after, Jeſus meeting them while they were both fiſhing together, called them to him, and promiſed to make them fiſhers of men. Immediately they left their nets, followed him, (Matt. iv. 19.) and never afterwards ſeparated from him.

After our Saviour's aſcenſion, his apoſtles having determined by lot what parts of the world they ſhould ſeverally take, Scythia and the neighbouring countries fell to St Andrew, who according to Euſebius, after he had planted the goſpel in feveral places, came to Patræ in Achaia, where, endeavouring to convert the proconſul Ægeas, he was by that governor's orders ſcourged, and then crucified. The particular time of his ſuffering martyrdom is not known; but all the ancients and modern martyrologies, both of the Greeks and Latins, agree in celebrating his feſtival upon the 30th of November. His body was embalmed, and decently interred at Patræ by Maximilla, a lady of great quality and eſtate. Afterwards it was removed to Conſtantinople by Conſtantine the Great, and buried in the great church, which he had built to the honour of the apoſtles. There is a croſs to be ſeen at this day in the church of St Victor at Marſeilles, which is believed by the Romaniſts to be the ſame that St Andrew was faſtened to. It is in the ſhape of the letter X, and is incloſed in a ſilver ſhrine. Peter Chryſologus ſays, that he was crucified upon a tree; and the ſpurious Hippolytus aſſures us it was an olive-tree.

Andrew, or *Knights of St Andrew*, an order of knights, more uſually called the order of the thiſtle. (See Thistle.)

Knights of St Andrew, is alſo an order inſtituted by Peter the Great of Muſcovy in 1698; the badge of which is a golden medal; on one ſide whereof is repreſented St Andrew's croſs, with theſe words, *Cazar Pierre monarque de tout la Ruſſie.* This medal, being faſtened to a blue ribbon, is ſuſpended from the right ſhoulder.

St Andrew's Croſs, one in form of the letter X. (See Cross.)

St Andrew's Day, a feſtival of the Chriſtian church, celebrated on the 30th of November, in honour of the apoſtle St Andrew.

ANDREW's (St), a town of Fifeſhire in Scotland, once the metropolis of the Pictiſh kingdom, lying in W. Long. 2. 25. N. Lat. 56. 18. If we may credit legend, St Andrew's owes its origin to a ſingular accident. St Regulus (or St *Rule*, as he is likewiſe called), a Greek of Achaia, was warned by a viſion to leave his native country, and viſit Albion, an iſle placed in the remoteſt part of the world; and to take with him the arm-bone, three fingers, and three toes, of St Andrew. He obeyed, and ſet ſail with his companions, but had a very tempeſtuous paſſage. After being toſſed for ſome time on a ſtormy ſea, he was at laſt ſhipwrecked on the coaſts of Otholania, in the territories of Herguſtus king of the Picts, in the year 370. On hearing of the arrival of the ſtrangers, with their precious relicts, the king immediately gave orders for their reception, afterwards preſenting the ſaint with his own palace, and building near it the church, which ſtill bears the name of *St Regulus.*

At this time the place was ſtyled *Mucroſs*, or the *land of boars:* all round was foreſt, and the lands beſtowed on the Saint were called *Byrehid.* The boars equalled in ſize the ancient Erymanthian; as a proof of which, two tuſks, each ſixteen inches long and four thick, were chained to the altar of St Andrew's. St Regulus changed the name to *Kilrymont;* and eſtabliſhed here the firſt Chriſtian prieſts of the country, called *Culdees.* This church was ſupreme in the kingdom of the Picts; Ungus having granted to God and St Andrew, that it ſhould be the head and mother of all the churches in his dominions. He alſo directed that the croſs of St Andrew ſhould become the badge of the country. In 518, after the conqueſt of the Picts, he removed the epiſcopal ſee to St Andrew's, and the Biſhop was ſtyled *maximus Scotorum epiſcopus.* In 1441, it was erected into an archbiſhopric by Sextus IV. at the interceſſion of James III. In 1606, the priory was ſuppreſſed; and, in 1617, the power of election was transferred to eight biſhops, the principal of St Leonard's college, the archdeacon, the vicars of St Andrew's, Leuchars, and Coupar. This ſee contained the greateſt part of the ſhire of Fife, with a part of Perth, Forfar, and Kincardine ſhires, and a great number of pariſhes, churches, and chapels in other dioceſes.

The town of St Andrew's was erected into a royal borough by David I. in the year 1140, and their privileges afterwards confirmed. The charter of Malcolm II. is preſerved in the tolbooth; and appears written on a bit of parchment, but the contents equally valid with what would at this time require whole ſkins. Here alſo are kept the ſilver keys of the city; which, for form's ſake, are delivered to the king, if he ſhould viſit the place, or to a victorious enemy, in token of ſubmiſſion. In this place, likewiſe, is to be ſeen the monſtrous ax which, in 1646, took off the heads of Sir Robert Spotſwood and other diſtinguiſhed loyaliſts. The town underwent a ſiege in 1337; at which time it was poſſeſſed by the Engliſh, and other partizans of Baliol; but the loyaliſts, under the Earls of March and Fife, made themſelves maſters of it in three weeks, by the help of their battering machines.

St Andrew's is now greatly reduced in the number of its inhabitants; at preſent ſcarcely exceeding 2000. It is impoſſible to aſcertain the ſum when it was the ſeat of the primate: all that can be known is, that during the period of its ſplendor, there were between 60 and 70 bakers; but now 9 or 10 are ſufficient for the place. It is a mile in circuit, and contains three principal ſtreets. On entering the weſt port, a well-built ſtreet, ſtraight, and of a vaſt length and breadth, appears; but ſo graſs-grown, and preſenting ſuch a dreary ſolitude, that it forms the perfect idea of having been laid waſte by the peſtilence.

The cathedral of St Andrew's was founded by Biſhop Arnold in 1161, but did not attain its full magnificence till 1318. Its length from eaſt to weſt was 370 feet; that of the tranſept, 322. But tho' this vaſt pile was 157 years in building, John Knox, in June 1559, effected its demolition in a ſingle day; and ſo effectually has it been deſtroyed, that nothing now remains but part of the eaſt and weſt ends, and of the ſouth ſide.

Near the eaſt end is the chapel of St Regulus; the tower of which is a lofty equilateral triangle, of 20 feet each ſide, and 103 feet high; the body of the chapel remains,

Andrew's. remains, but the two side-chapels are ruined. The arches of the windows and doors are round, and some even more than semicircles; an undoubted proof of their antiquity.

The priory was founded by Alexander I. in 1122; and the monks (canons regular of St Augustine) were brought from Scone, in 1140, by Robert, Bishop of this see. By an act of parliament, in the time of James I. the prior had precedence of all abbots and priors, and on the days of festival wore a mitre and all episcopal ornaments. Dependent on this priory were those of Lochleven, Portmoak, Monimusk, the Isle of May, and Pittenweem, each originally a seat of the Culdees. The revenues of the house were vast, viz. In money 2237 l. 2 s. $10\frac{1}{2}$ d.; 38 chaldrons, 1 boll, 3 firlots of wheat; 132 ch. 7 bolls of bear; 114 ch. 3 bolls 1 peck of meal; 151 ch. 10 bolls 1 firlot 1 peck and a half of oats; 3 ch. 7 bolls of peas and beans: 480 acres of land also belonged to it. Nothing remains of the priory except the walls of the precinct, which show its vast extent. In one part is a most artless gateway, formed only of seven stones. This inclosure begins near the cathedral, and extends to the shore.

The other religious houses were, one of Dominicans, founded, in 1274, by Bishop Wishart; another of Observantines, founded by Bishop Kennedy, and finished by his successor Patrick Graham in 1478; and, according to some, the Carmelites had a fourth.

Immediately above the harbour stood the collegiate church of Kirk-heugh, originally founded by Constantine III. who, retiring from the world, became here a Culdee. From its having been first built on a rock, it was styled, *Præpositura Sanctæ* MARIÆ *de rupe*.

On the east side of the city are the poor remains of the castle, on a rock overlooking the sea. This fortress was founded, in 1401, by Bishop Trail, who was buried near the high altar of the cathedral, with this singular epitaph:

Hic fuit ecclesiæ directa columna, fenestra
Lucida, thuribulum redolens, campana sonora.

This castle was the residence of cardinal Beaton; who, after the death of George Wishart, apprehending some danger, caused it to be fortified so strongly as to be at that time deemed impregnable. In this fortress, however, he was surprized and assassinated by Norman Lesly with 15 others. They seized on the gate of the castle early in the morning of May 29, 1546; it having been left open for the workmen who were finishing the fortifications: and having placed centinels at the door of the cardinal's apartment, they awakened his numerous domestics one by one; and, turning them out of the castle, they without violence, tumult, or offering an injury to any other person, inflicted on Beaton the death he justly merited. The conspirators were immediately besieged in this castle by the regent, earl of Arran; and notwithstanding they had acquired no greater strength than 150 men, they resisted all his efforts for five months. This, however, was owing to the unskilfulness of the besiegers more than to the strength of the place or the valour of the besieged; for in 1547 the castle was reduced and demolished. The entrance of it is still to be seen; and the window is shown, out of which it is said the cardinal leaned to glut his eyes with the cruel martyrdom of George Wishart, who was Andrew's. burnt on a spot beneath.

In the church of St Salvator is a most beautiful tomb of bishop Kennedy, who died, an honour to his family, in 1466. The Gothic work is uncommonly elegant. Within the tomb were discovered six magnificent maces, which had been concealed here in troublesome times. One was given to each of the other three Scotch universities, and three are preserved here. In the top is represented our Saviour; around are angels, with the instruments of the passion.

With these are shown some silver arrows, with large silver plates affixed to them, on which are inscribed the arms and names of the noble youth, victors in the annual competitions in the generous art of archery, which were dropt but a few years ago; and golf is now the reigning game. That sport, and foot-ball, were formerly prohibited, as useless and unprofitable to the public; and at all *weapon schawings*, or reviews of the people, it was ordered, that *fute-ball and golfe be utterly cryed down, and that bow-markes be maid at ilk parish kirk, a pair of butts and schutting be used; and that ilk man schutte sex shottes at least, under the paine to be raiped upon them that cummis not, at least twa pennyes to be given to them that cummis to the bow-markes ta drinke.*

The celebrated university of this city was founded in 1411, by bishop Wardlaw; and the next year he obtained from Benedict III. the bull of confirmation. It consisted once of three colleges. 1. St Salvator's, founded in 1458, by Bishop Kennedy. This is a handsome building, with a court or quadrangle within: on one side is the church, on another the library; the third contains apartments for students: the fourth is unfinished. 2. St Leonard's college was founded by prior Hepburn, in 1522. This is now united with the last, and the buildings sold, and converted into private houses. 3. The new, or St Mary's college, was established by archbishop Hamilton in 1553; but the house was built by James and David Bethune, or Beaton, who did not live to complete it. This is said to have been the site of a *schola illustris* long before the establishment even of the university; where several eminent clergymen taught, gratis, the sciences and languages. But it was called the *new college*, because of its late erection into a divinity college by the archbishop.

The university is governed by a chancellor, an office originally designed to be perpetually vested in the archbishops of St Andrew's; but since the reformation, he is elected by the two principals, and the professors of both the colleges.

The rector is the next great officer; to whose care is committed the privileges, discipline, and statutes of the university. The colleges have their rectors, and professors of different sciences, who are indefatigable in their attention to the instruction of the students, and to that essential article their morals. This place possesses several very great advantages respecting the education of youth. The air is pure and salubrious; the place for exercise, dry and extensive; the exercises themselves are healthy and innocent. The university is fixed in a peninsulated country; remote from all commerce with the world, the haunt of dissipation. From the smallness of the society every student's character is perfectly known.

No

Andrew's. No little irregularity can be committed, but it is instantly discovered and checked: vice cannot attain a head in this place, for the incorrigible are never permitted to remain the corrupters of the rest.

The trade of St Andrew's was once very considerable. So late as the reign of Charles I. this place had 30 or 40 trading vessels, and carried on a considerable herring and white fishery, by means of busses, in deep water; which fisheries had for ages been the grand source of their commerce, wealth, and splendor. After the death of the king, this whole coast, and St Andrew's in particular, became a scene of murder, plunder, and rapine: every town suffered in proportion to its magnitude and opulence. Nor were those hypocritical ruffians satisfied with the shipping, merchandise, plate, cattle, and whatever came within their sight; they also laid the whole coast under contribution. St Andrew's was required to pay 1000 l. but the inhabitants not being able to raise that sum after being thus plundered, the general compounded for 500 l. which was raised by a loan at interest, and hath remained a burden upon the corporation, it is believed, ever since.

The harbour is artificial, guarded by piers, with a narrow entrance, to give shelter to vessels from the violence of a very heavy sea, by the encroachments of which it has suffered much. The manufactures this city might in former times possess, are now reduced to one, that of golf-balls; which, trifling as it may seem, maintains a great number of people. It is, however, commonly fatal to the artists; for the balls are made by stuffing a great quantity of feathers into a leathern case, by help of an iron rod, with a wooden handle, pressed against the breast, which seldom fails to bring on a consumption.

Andrews (Lancelot), bishop of Winchester, was born at London in 1555, and educated at Cambridge. After several preferments, he was made bishop, first of Chichester, then of Ely, and, in 1618, was raised to the see of Winchester. This very learned prelate, who was distinguished by his piety, charity, and integrity, may be justly ranked with the best preachers and completest scholars of his age; he appeared to much greater advantage in the pulpit than he does now in his works, which abound with Latin quotations and trivial witticisms. His sermons, though full of puns, were suited to the taste of the times in which he lived, and were consequently greatly admired. He was a man of polite manners and lively conversation; and could quote Greek and Latin authors, or even pun, with king James. There is a pleasant story related of him in the life of Waller the poet. When that gentleman was young, he had the curiosity to go to court, and stood in the circle to see king James dine; where, among other company, there sat at table two bishops, Neale and Andrews. The king proposed aloud this question, Whether he might not take his subjects money when he needed it, without all this formality of parliament? Neale replied, "God forbid you should not; for you are the breath of our nostrils." Whereupon the king turned, and said to the bishop of Winchester, "Well, my lord, what say you?" "Sir (replied the bishop), I have no skill to judge of parliamentary cases." The king answered, "No put-offs, my lord; answer me presently." "Then, Sir (said he), I think it lawful for you to take my brother Neale's money, for he offers it." Mr Waller says, the company was pleased with this answer, but the wit of it seemed to affect the king; for a certain lord coming soon after, his majesty cried out, "O, my lord, they say you lig with my lady." "No, Sir (says his lordship, in confusion), but I like her company because she has so much wit." "Why then (says the king) do not you lig with my lord of Winchester there?"—This great prelate was in no less reputation and esteem with king Charles I. than he had been with his predecessors. He died at Winchester-house in Southwark, September 27, 1626, in the 71st year of his age; and was buried in the parish-church of St Saviour's, where his executors erected to him a very fair monument of marble and alabaster, on which is an elegant inscription, in Latin, written by one of his chaplains. Mr Milton also, at 17 years of age, wrote a beautiful elegy on his death, in the same language. Bishop Andrews had, 1. A share in the translation of the Pentateuch, and the historical books from Joshua to the first book of Chronicles exclusively. He also wrote, 2. *Tortura Torti*, in answer to a work of cardinal Bellarmine, in which that cardinal assumes the name of Matthew Tortus. 3. A Manual of Private Devotions: and, 4. A Manual of Directions for the Visitation of the Sick; besides the Sermons and Tracts, in English and Latin, published after his death.

Andria || Androgynes.

ANDRIA, in Grecian antiquity, public entertainments first instituted by Minos of Crete, and, after his example, appointed by Lycurgus at Sparta, at which a whole city or a tribe assisted. They were managed with the utmost frugality, and persons of all ages were admitted, the younger sort being obliged by the lawgiver to repair thither as to schools of temperance and sobriety.

Andria, is a city and a bishop's see in the territory of Bari, in the kingdom of Naples. It is pretty large, well peopled, and seated in a spacious plain, four miles from the Adriatic coast. E. Long. 17. 4. N. Lat. 41. 15.

ANDRISCUS, a man of mean extraction, who, pretending to be the son of Perseus last king of Macedonia, took upon him the name of *Philip*, for which reason he was called *Pseudo-Philippus*, the *False Philip*. After a complete victory over Juventus, the Roman Prætor sent against him, he assumed kingly power, but exercised it with vast cruelty. At last, the Romans obliged him to fly into Thrace, where he was betrayed and delivered into the hands of Metellus. This victory gained Macedonia once more into the power of the Romans, and to Metellus the name of *Macedonicus*, but cost the Romans 25,000 men. Andriscus adorned the triumph of Metellus, walking in chains before the general's chariot.

ANDROAS, or Androdamas, among ancient naturalists, a kind of pyritæ, to which they attributed certain magical virtues.

ANDROGEUS, in fabulous history, the son of Minos king of Crete, was murdered by the Athenian youth and those of Megara, who envied his being always victor at the Attic games. But Minos having taken Athens and Megara, obliged the inhabitants to send him an annual tribute of seven young men and as many virgins, to be devoured by the Minotaur; but Theseus delivered them from that tribute.

ANDROGYNES, in natural history, a name given

Andro-gynes.

ven to thoſe living creatures which, by a monſtrous formation of their generative parts, ſeem (for it is only ſeeming) to unite in themſelves the two ſexes, that of the male and of the female. This *luſus naturæ*, this defect, or perhaps redundancy, in the animal-ſtructure, is deſcribed by medical authors in the following manner. ‘ There is a depravation in the ſtructure of the ‘ parts intended by nature for propagation, when, be- ‘ ſides thoſe concealed parts that are found neceſſary ‘ for the diſcharge of prolific functions, the *pudenda* ‘ of the other ſex likewiſe appear. This monſtrous ‘ production of nature is diverſified in four different ‘ ways; of which three appear in males and one in fe- ‘ males. In men, the female pudendum, cloathed with ‘ hair, ſometimes appears contiguous to the perinæum; ‘ at other times, in the middle of the ſcrotum; at other ‘ times, which conſtitutes the third diverſity, through ‘ that part itſelf which in the midſt of the ſcrotum ex- ‘ hibits the form of a pudendum, urine is emitted. ‘ Near that part which is the teſt of puberty, and a- ‘ bove the pudendum, even in females, the maſculine ‘ genitals appear in ſome, conſpicuous in all their three ‘ forms, one reſembling the *viretram* or yard, the other ‘ like the two teſticles: but for the moſt part it hap- ‘ pens, that, of the two inſtruments of generation, one ‘ is feeble and inert; and it is extremely rare that both ‘ are found ſufficiently valid and proper for feats of ‘ love; nay, even in a great many, both theſe mem- ‘ bers are deficient and impotent, ſo that they can per- ‘ form the office neither of a male nor of a female.’

With reſpect to them, it appears, from a collation of all the circumſtances which have been obſerved by naturaliſts worthy of credit, that there is no ſuch thing as a perfect *androgyne*, or real hermaphrodite; that is to ſay, a living creature which, by its unnatural, or rather preternatural ſtructure, poſſeſſes the genuine powers of both ſexes, in ſuch a manner as to be qualified for performing the functions of either with ſucceſs: the irregularity of their fabrication almoſt always conſiſts in ſomething ſuperfluous added to one of the two ſexes, which gives it the appearance of the other, without beſtowing the real and characteriſtical diſtinction; and every *hermaphrodite* is almoſt always a very woman. Since this monſtrous exhibition of nature is not ſuch as to abrogate the rights or deſtroy the character of humanity amongſt human beings, this involuntary misfortune implies no right to deprive thoſe upon whom it is inflicted by nature, of the privileges natural to every citizen; and as this deficiency is no more infectious than any other corporeal mutilation, it is not eaſy to ſee why marriage ſhould be prohibited to one of theſe unhappy beings, merely on account of its equivocal appearance, which acts in the character of its prevailing ſex. If ſuch a creature, by the defect of its conſtruction, ſhould be barren; this does not infer any right of diſſolving the marriage which it may have contracted, more than the ſame ſterility proceeding from any cauſe whether known or unknown, if his or her conſort ſhould not on that account require a divorce. It is only the licentious abuſe either of one or the other ſex which can be ſubjected to the animadverſion of the police. See Hermaphrodite.

Such are the ſentiments of the authors of the French Encyclopédie. After all, we cannot forbear to add, that from ſuch heterogeneous matches nature ſeems to recoil with innate and inextinguiſhable horror. Nor are any of theſe invincible averſions implanted in our frame without a final cauſe worthy of its Author. We would gladly aſk theſe free-thinking gentlemen, In caſes where the ſexes are ſo unnaturally confounded, how the police can, by its moſt ſevere and rigorous animadverſions, either detect or prevent thoſe licentious abuſes againſt which they remonſtrate? Since, therefore, an evil ſo baneful to human ſociety could no otherwiſe be prevented than by the ſanction of Nature againſt ſuch horrible conjunctions, the inſtinctive antipathy which they inſpire was highly worthy of her wiſdom and purity.

Andro-gynes, Androgy-nous.

Androgynes, in ancient mythology, creatures of whom, according to the fable, each individual poſſeſſed the powers and characters of both ſexes, having two heads, four arms, and two feet. The word itſelf is compounded of two Greek radical words; ἀνὴρ, in genitive ἀνδρὸς, a *male*; and γυνὴ, a *female*. Many of the rabbinical writers pretend, that Adam was created double, one body being male, the other female, which in their origin not being eſſentially joined, God afterwards did nothing but ſeparate them.

The gods, ſays Plato in his *Banquet*, had formed the ſtructure of man round, with two bodies and two ſexes. This fantaſtic being, poſſeſſing in itſelf the whole human ſyſtem, was endowed with a gigantic force, which rendered it inſolent, inſomuch that it reſolved to make war againſt the gods. Jupiter, exaſperated, was going to deſtroy it; but, ſorry at the ſame time to annihilate the human race, he ſatisfied himſelf with debilitating this double being, by disjoining the male from the female, and leaving each half to ſubſiſt with its own powers alone. He aſſigned to Apollo the taſk of repoliſhing theſe two half bodies, and of extending their ſkins ſo that their whole ſurface might be covered. Apollo obeyed, and faſtened it at the *umbilicus*: If this half ſhould ſtill rebel, it was once more to be ſubdivided by another ſection, which would only leave it one of the parts of which it was then conſtituted; and even this fourth of a man was to be annihilated, if it ſhould perſiſt in its obſtinacy and miſchief. The idea of theſe *androgynes* might well be borrowed from a paſſage in Moſes, where that hiſtorian of the birth and infancy of nature deſcribes Adam as calling Eve *bone of his bone* and *fleſh of his fleſh*. However this may be, the fable of Plato has been uſed with great ingenuity by a French poet, who has been rendered almoſt as conſpicuous by his misfortunes as by his verſes. With the ancient philoſopher, he attributes the propenſity which attracts one of the ſexes towards the other, to the natural ardour which each half of the *androgynes* feels for reunion; and their inconſtancy, to the difficulty which each of the ſeparated parts encounters in its efforts to recover its proper and original half. If a woman appears to us amiable, we inſtantly imagine her to be that moiety with whom we ſhould only have conſtituted one whole, had it not been for the inſolence of our original double-ſexed progenitor:

> The heart, with fond credulity impreſs’d,
> Tells us the half is found, and hopes for reſt;
> But ’tis our curſe, that ſad experience ſhows,
> We neither find our half, nor gain repoſe.

ANDROGYNOUS, in zoology, an appellation given to animals which have both the male and female ſex

Androides. ſex in the ſame individual.—In botany, the term is applied to ſuch plants as bear both male and female flowers on the ſame root.

ANDROIDES, in mechanics, a human figure, which, by certain ſprings or other movements, is capable of performing ſome of the natural motions of a living man. The motions of the human body are more complicated, and conſequently more difficult to be imitated, than thoſe of any other creature; whence the conſtruction of an *androides*, in ſuch a manner as to imitate any of theſe actions with tolerable exactneſs, is juſtly ſuppoſed to indicate a greater ſkill in mechanics than any other piece of workmanſhip whatever.

A very remarkable figure of this kind appeared in Paris, in the year 1738. It repreſented a flute-player, and was capable of performing many different pieces of muſic on the German flute; which, conſidering the difficulty of blowing that inſtrument, the different contractions of the lips neceſſary to produce the diſtinctions between the high and low notes, and the complicated motions of the fingers, muſt appear truly wonderful.

This machine was the invention of M. Vaucanſon, member of the Royal Academy of Sciences; and a particular deſcription of it was publiſhed in the Memoirs of the Academy for that year.

The figure itſelf was about five feet and an half in height, ſituated at the end of an artificial rock, and placed upon a ſquare pedeſtal four feet and an half high and three and an half broad. The air entered the body by three pipes ſeparated one from the other. It was conveyed to them by nine pair of bellows, three of which were placed above and ſix below. Theſe were made to expand and contract regularly in ſucceſſion, by means of an axis of ſteel turned round by ſome clock-work. On this axis were different protuberances at proper diſtances, to which were fixed cords thrown over pullies, and terminating in the upper boards of the bellows, ſo that, as the axis turned, theſe boards were alternately raiſed and let down. A contrivance was alſo uſed to prevent the diſagreeable hiſſing fluttering noiſe uſually attending the motion of bellows. This was by making the cord, by which the bellows was moved, preſs, in its deſcent, upon one end of a ſmaller lever, the other end of which aſcending forced open the ſmall leathern valve that admitted the air, and kept it ſo, till, the cord being relaxed by the deſcent of the upper board, the lever fell, and the air was forced out. Thus the bellows performing their functions conſtantly without the leaſt hiſſing or other noiſe by which it could be judged in what manner the air was conveyed to the machine. The upper boards of three of the pairs of bellows were preſſed down by a weight of four pounds, that of three others by a weight of two pounds, and thoſe of the three remaining ones by nothing but their own weight.

The three tubes, by which the air entered, terminated in three ſmall reſervoirs in the trunk of the figure. There they united, and, aſcending towards the throat, formed the cavity of the mouth, which terminated in two ſmall lips adapted in ſome meaſure to perform their proper functions. Within this cavity alſo was a ſmall moveable tongue; which by its play, at proper periods, admitted the air, or intercepted its paſſage to the flute.

The fingers, lips, and tongue, received their proper directions by means of a ſteel cylinder turned by clock-work. It was divided into 15 equal parts, which Androides. by means of pegs, preſſing upon the ends of 15 different levers, cauſed the other extremities to aſcend. Seven of theſe levers directed the fingers, having wires and chains affixed to their aſcending extremities, which being attached to the fingers, cauſed them aſcend in proportion as the other extremity was preſſed down by the motion of the cylinder, and *vice verſa*. Thus the aſcent or deſcent of one end of a lever produced a ſimilar aſcent or deſcent in the correſponding finger, by which one of the holes of the flute was occaſionally opened or ſtopped, as by a living performer. Three of the levers ſerved to regulate the ingreſs of the air, being contrived ſo as to open and ſhut, by means of valves, the three reſervoirs of air above mentioned, ſo that more or leſs ſtrength might be given, and a higher or lower note produced as occaſion required. The lips were, by a ſimilar mechaniſm, directed by four levers, one of which opened them, to give the air a freer paſſage; the other contracted them; the third drew them backward; and the fourth puſhed them forward. The lips were projected upon that part of the flute which receives the air; and, by the different motions already mentioned, modified the tone in a proper manner.—The remaining lever was employed in the direction of the tongue, which it eaſily moved ſo as to ſhut or open the mouth of the flute.

Thus we ſee how all the motions neceſſary for a German-flute-player could be performed by this machine; but a conſiderable difficulty ſtill remains, namely, how to regulate theſe motions properly, and make each of them follow in juſt ſucceſſion. This, however, was effected by the following ſimple method. The extremity of the axis of the cylinder was terminated on the right ſide by an endleſs ſcrew, conſiſting of twelve threads, each placed at the diſtance of a line and an half from the other. Above this ſcrew was fixed a piece of copper, and in it a ſteel pivot, which, falling in between the threads of the ſcrew, obliged the cylinder to follow the threads, and, inſtead of turning directly round, it was continually puſhed to one ſide. Hence, if a lever was moved, by a peg placed on the cylinder, in any one revolution, it could not be moved by the ſame peg in the ſucceeding revolution, becauſe the peg would be moved a line and an half beyond it by the lateral motion of the cylinder. Thus, by an artificial diſpoſition of theſe pegs in different parts of the cylinder, the ſtatue was made, by the ſucceſſive elevation of the proper levers, to exhibit all the different motions of a flute-player, to the admiration of every one who ſaw it.

The conſtruction of machines capable of imitating even the mechanical actions of the human body, ſhow exquiſite ſkill; but what ſhall we ſay of one capable, not only of imitating actions of this kind, but of acting as external circumſtances require, as though it were endowed with life and reaſon? This, nevertheleſs, has been done. M. de Kempelen, a gentleman of Preſburg in Hungury, excited by the performances of M. de Vaucanſon, at firſt endeavoured to imitate them, and at laſt far excelled them. This gentleman conſtructed an Androides capable of playing at cheſs!—Every one who is in the leaſt acquainted with this game muſt know, that it is ſo far from being mechanically performed, as to require a greater exertion of the judgment

Plate XXIX.

Fig. 3.
ANEMOMETER

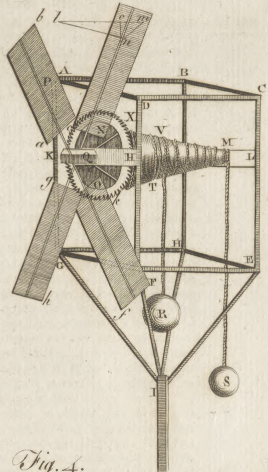


Fig. 5.
ANGUIS VENTRALIS
or Glass Snake

Fig. 2.
ANDROMEDA
Paniculata.

Fig. 4.
ANEMOSCOPE

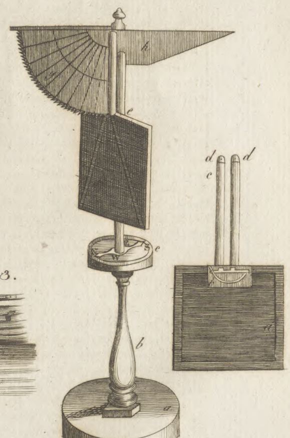
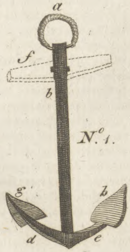


Fig 1
ANCHOR

N.° 1.



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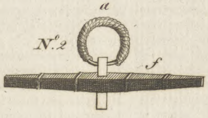
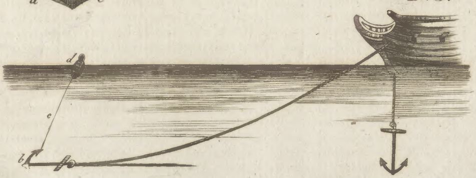


N.° 3.



A. Bell Sculp.t

ment and rational faculties than is sufficient to accomplish many matters of greater importance. An attempt therefore, to make a wooden chess-player, must appear as ridiculous as to make a wooden preacher or counsellor of state. That this machine really was made, however, the public have had ocular demonstration. The inventor came over to Britain in 1783, where he remained above a year with his automaton.

It is a figure as large as life, in a Turkish dress, sitting behind a table with doors, of three feet and a half in length, two in depth, and two and a half in height. The chair on which it sits is fixed to the table, which runs on four wheels. The automaton leans its right arm on the table, and in its left hand holds a pipe: with this hand it plays after the pipe is removed. A chess-board of 18 inches is fixed before it. This table, or rather cupboard, contains wheels, levers, cylinders, and other pieces of mechanism; all which are publicly displayed. The vestments of the automaton are then lifted over its head, and the body is seen full of similar wheels and levers. There is a little door in its thigh, which is likewise opened; and with this, and the table also open, and the automaton uncovered, the whole is wheeled about the room. The doors are then shut, and the automaton is ready to play; and it always takes the first move.

At every motion the wheels are heard; the image moves its head, and looks over every part of the chess-board. When it checks the queen, it shakes its head twice, and thrice in giving check to the king. It likewise shakes its head when a false move is made, replaces the piece, and makes its own move; by which means the adversary loses one.

Mr de Kempelen remarks as the most surprising circumstance attending his automaton, that it had been exhibited at Presburg, Vienna, Paris, and London, to thousands, many of whom were mathematicians and chess-players, and yet the secret by which he governed the motion of its arm was never discovered. He prided himself solely on the construction of the mechanical powers, by which the arm could perform ten or twelve moves. It then required to be wound up like a watch, after which it was capable of continuing the same number of motions.

The automaton could not play unless Mr de Kempelen or his substitute was near it to direct its moves. A small square box, during the game, was frequently consulted by the exhibiter; and herein consisted the secret, which he said he could in a moment communicate. He who could beat Mr de Kempelen was, of course, certain of conquering the automaton. It was made in 1769. His own account of it was: "C'est une bagatelle qui n'est pas sans merite du cote du mechanisme, mais les effets n'en paroissent si merveilleux que par la hardiesse de Pidee, & par l'heureux chioz des moyens employes pour faire illusion."

The strongest and best-armed loadstone was allowed to be placed on the machine by any of the spectators.

As the inventor of this admirable piece of mechanism hath not yet thought proper to communicate to the public the means by which it is actuated, it is in vain for any, except those who are exquisitely skilled in mechanics, to form conjectures concerning them.—Many other curious imitations of the human body, as well as that of other animals, have been exhibited, though none of them equal to the last mentioned one. See the article Automaton.

ANDROLEPSY, in Grecian antiquity, an action allowed by the Athenians against such as protected persons guilty of murder. The relations of the deceased were empowered to seize three men in the city or house whither the malefactor had fled, till he were either surrendered, or satisfaction made some way or other for the murder.

ANDROMACHE, the wife of the valiant Hector, the mother of Astyanax, and daughter of Eton king of Thebes in Cilicia. After the death of Hector and the destruction of Troy, she married Pyrrhus; and afterwards Helenus the son of Priam, with whom she reigned over part of Epirus.

ANDROMEDA, in astronomy, a northern constellation, behind Pegasus, Cassiopeia, and Perseus. It represents the figure of a woman chained; and is fabled to have been formed in memory of Andromeda, daughter of Cepheus and Cassiopeia, and wife of Perseus, by whom she had been delivered from a sea-monster, to which she had been exposed to be devoured for her mother's pride. Minerva translated her into the heavens.

The stars in the constellation Andromeda in Ptolemy's catalogue are 23, in Tycho's 22, in Bayer's 27, in Mr Flamsted's no less than 84.

Andromeda, the name of a celebrated tragedy of Euripides, admired by the ancients above all the other compositions of that poet, but now lost.

It was the representation of this play, in a hot summer day, that occasioned that epidemic fever, or phrenzy, for which the Abderites are often mentioned, wherein they walked about the streets, rehearsing verses, and acting parts of this piece. See Abdera.

Andromeda, or *Marsh Cystus:* A genus of the monogynia order, belonging to the decandria class of plants; and in the natural method ranking under the 18th order, *Bicornes.* The characters are: The *calyx* is a quinquepartite perianthium, small, coloured, and persistent: The *corolla* is monopetalous, campanulated, and quinquefid, with reflected divisions: The *stamina* consist of ten subulated filaments, shorter than the corolla; the antheræ two-horned and nodding: The *pistillum* has a roundish germen; a cylindric stylus larger than the stamina, and persistent; and an obtuse stigma: The *pericarpium* is a roundish five-cornered capsule, with five cells and five valves: The *seeds* are very numerous, roundish, and glossy.

Species. 1. The polifolia is a low plant, growing naturally in bogs in the northern countries. It is difficultly preserved in gardens; and, being a plant of no great beauty, is seldom cultivated. 2. The mariana, a native of North America. It is a low shrub, sending out many woody stalks from the root, which are garnished with oval leaves placed alternately; the flowers are collected in small bunches, are of an herbaceous colour, and shaped like those of the strawberry-tree. They appear in June and July. 3. The paniculata* is a native of Virginia and Carolina, growing in moist places. The plants usually arrive at the height of ten feet, with thin leaves set alternately, and having their edges finely serrated. The flowers are tubulous, small, and of a greenish white, closely set horizontally on one side of the slender stalks. These flowers are succeeded by berries, which open when ripe; and divide into five sections,

* Plate XXIX. fig. 2.

tions, incloſing many ſmall ſeeds. 4. The arborea is a native of the ſame countries, where it is called the *ſorrel-tree.* It grows to the height of 20 feet, with a trunk uſually five or ſix inches thick. The branches are ſlender, thick ſet with leaves like thoſe of the pear-tree. From the ends of the branches proceed many ſlender ſtalks, on one ſide of which hang many ſmall white flowers like thoſe of the ſtrawberry-tree. 5. The calyculata, is a native of Siberia, and likewiſe of North America. It grows on moſſy land, and is therefore very difficult to keep in gardens. The leaves are ſhaped like thoſe of the box-tree, and are of the ſame conſiſtence, having ſeveral ſmall punctures on them. The flowers grow in ſhort ſpikes from the extremity of the branches. They are produced ſingle between two leaves, are of a white colour, and a cylindrical or pitcher-like ſhape. There are ten other ſpecies.

Propagation and culture. All theſe ſorts, except four, are hardy plants. The fourth ſpecies requires to be ſheltered from froſt in winter, but in the ſummer ſhould be frequently watered.

The above plants ſucceed beſt upon boggy and moiſt grounds. You muſt procure the ſeeds from the places where they grow naturally; a year before which a boggy or the moiſteſt part of your garden ſhould be dug, and the roots of all weeds cleared off. As the weeds begin to riſe, ſo conſtantly ſhould the ground be again dug, and ſea or drift ſand ſhould be plentifully mixed with the natural ſoil. By this management till the ſeeds arrive, the ground being made tolerably fine, the ſeeds ſhould be ſown very ſhallow in the moiſt or boggy land; or if the land ſhould be ſo boggy that it cannot be eaſily worked ſo as to be proper for the reception of the ſeeds, then let a ſufficient quantity of ſoil from a freſh paſture, mixed with drift ſand, be laid over the bog, and let the ſeeds be ſown therein. The bog will in time abſorb this ſoil, but the ſeeds will come up; and this is the moſt effectual method of procuring plants of this kind from ſeeds. The firſt year after they come up they ſhould be ſhaded in very hot weather; and after that they will require little or no care. Another method of increaſing theſe ſhrubs is by layers or ſuckers; ſo that whoever has not the conveniency of procuring the ſeeds from abroad, ſhould get a plant or two of the ſorts he moſt likes. Theſe he ſhould plant in a boggy ſituation, and in a very little time he will have increaſe enough; for they throw out ſuckers in prodigious plenty, and, if they like the ſituation, to a great diſtance. Theſe may be taken off, and planted where they are to remain.

ANDRON, in Grecian antiquity, denotes the apartment in houſes deſigned for the uſe of men; in which ſenſe it ſtands oppoſed to *Gynæceum.*—The Greeks alſo gave their dining-rooms the title of *andron,* becauſe the women had no admittance to feaſts with the men.

ANDRONA, in ancient writers, denotes a ſtreet, or public place, where people met and converſed together. In ſome writers, *androna* is more expreſsly uſed for the ſpace between two houſes; in which ſenſe, the Greeks alſo uſe the term ανδρωνας, for the way or paſſage between two apartments.

ANDRONA is alſo uſed, in eccleſiaſtical writers, for that part in churches deſtined for the men. Anciently it was the cuſtom for the men and women to have ſeparate apartments in places of worſhip, where they performed their devotions aſunder; which method is ſtill religiouſly obſerved in the Greek church. The ανδρων, or *androna,* was in the ſouthern ſide of the church, and the womens apartment on the northern.

ANDRONICUS I. emperor of the Eaſt, cauſed Alexius II. who had been put under his care, to be ſtrangled; and then took poſſeſſion of the throne of Conſtantinople in 1183: but the people, becoming exaſperated at his cruelties, proclaimed Iſaac Angelus emperor, and put Andronicus in irons: they then thruſt out his eyes; and, having led him through the city in an ignominious manner, hanged him.

ANDRONICUS of Cyrrhus, built at Athens an octagon tower, with figures carved on each ſide, repreſenting the eight principal winds. A braſs triton at the ſummit, with a rod in its hand, turned round by the wind, pointed to the quarter from whence it blew. From this model is derived the cuſtom of placing weathercocks on ſteeples.

ANDROPHAGI, in ancient geography, the name of a nation whoſe country, according to Herodotus, was adjacent to Scythia. Their name, compounded of two Greek words, ſignifies *man-eaters.* Herodotus does not inform us whether their manner of ſubſiſting correſponded with their name; whether they were ſo ſavage as to eat human fleſh. See the article ANTHROPOPHAGI. They are repreſented, however, as the moſt barbarous and fierce of all nations. They were not governed by laws: the care of their cattle was their chief employment. Their dreſs was like that of the Scythians; and they had a language peculiar to themſelves.

ANDROPOGON, or MAN'S-BEARD, in botany: A genus of the monœcia order, belonging to the polygamia claſs; and in the natural method ranking under the 4th order, *Gramina.* The *hermaphrodite* calyx is a one-flowered bivalved glume: The *corolla* is a bivalved glume awn'd at the baſe: The *ſtamina* conſiſt of three capillary filaments; the antheræ are oblong and bifurcated: The *piſtillum* has an oval germen; with two capillary ſtyli coaleſced, and villous ſtigmata: There is no *pericarpium:* The *ſeed* is one, ſolitary, and covered. The *male* calyx, corolla, and ſtamina, the ſame with the hermaphrodite; but the corolla without the awn.—There are above 18 ſpecies. Of theſe the moſt remarkable is the nardus, which produces the Indian nard or ſpikenard of the ſhops. The ſpikenard, as brought from the Eaſt Indies, is a congeries of ſmall fibres iſſuing from one head, and matted cloſe together, ſo as to form a bunch about the ſize of the finger, with ſome ſmall ſtrings at the oppoſite end of the head. The matted fibres (which are the parts choſen for medicinal purpoſes) are ſuppoſed by ſome to be the head or ſpike of the plant, by others the root: they ſeem rather to be the remains of the withered ſtalks, or the ribs of the leaves: ſometimes entire leaves and pieces of ſtalks are found among them: we likewiſe now and then meet with a number of theſe bunches iſſuing from one root. Spikenard has a warm, pungent, bitteriſh taſte; and a ſtrong not very agreeable ſmell. It is ſtomachic and carminative; and ſaid to be alexipharmac, diuretic, and emmenagogue; but at preſent it is very little employed.

ANDROS, one of the ancient Cyclades, lying between

tween Tenedos and Eubœa: being one mile diſtant from the former, and ten from the latter. The ancients gave it various names, viz. Cauros, Laſia, Nonagria, Epagris, Antandros, and Hydruſia. The name of *Andros* it received from one Andreus, appointed, according to Diodorus Siculus, by Rhadamanthus, one of the generals, to govern the Cyclades, after they had of their own accord ſubmitted to him. As to the name of *Antandros*, the ſame author tells us, that Aſcanius the ſon of Æneas, being taken priſoner by the Pelaſgians, gave them this iſland for his ranſom, which on that account was called *Antandros*, or "delivered for one man." The name of *Hydruſia* it obtained in common with other places well ſupplied with water. It had formerly a city of great note, bearing the ſame name, and ſituated very advantageouſly on the brow of an hill, which commanded the whole coaſt. In this city, according to Strabo and Pliny, ſtood a famous temple dedicated to Bacchus. Near this temple, Mutianus, as quoted by Pliny, tells us, there was a ſpring called the *gift of Jupiter;* the water of which had the taſte of wine in the month of January, during the feaſts of Bacchus, which laſted ſeven days. The ſame author adds, that the waters, if carried to a place whence the temple could not be ſeen, loſt their miraculous taſte. Pauſanius makes no mention of this ſpring; but ſays, that, during the feaſt of Bacchus, wine flowed, or was at leaſt by the Andrians believed to flow, from the temple of that god. The prieſts, no doubt, found their account in keeping up this belief, by conveying, through ſecret conduits, a great quantity of wine into the temple.

The Andrians were the firſt of all the iſlanders who joined the Perſians at the time Xerxes invaded Greece; and therefore Themiſtocles, after the victory at Salamis, reſolved to attack the city of Andros, and oblige the inhabitants to pay large contributions for the maintenance of his fleet. Having landed his men on the iſland, he ſent heralds to the magiſtrates, acquainting them, that the Athenians were coming againſt them with two powerful divinities, *perſuaſion* and *force;* and therefore they muſt part with their money by fair means or foul. The Andrians replied, that they likewiſe had two mighty deities who were very fond of their iſland, viz *poverty* and *impoſſibility;* and therefore could give no money. Themiſtocles, not ſatisfied with this anſwer, laid ſiege to the town; which he probably made himſelf maſter of and deſtroyed, as we are informed by Plutarch, that Pericles, a few years after, ſent thither a colony of 250 Athenians. It was, however, ſoon retaken by the Perſians; and, on the overthrow of that empire by Alexander the Great, ſubmitted to him, along with the other iſlands. On his death it ſided with Antigonus, who was driven out by Ptolemy. The ſucceſſors of the laſt mentioned prince held it to the times of the Romans; when Attalus, king of Pergamus, beſieged the metropolis at the head of a Roman army; and, having taken it, was by them put in poſſeſſion of the whole iſland. Upon the death of Attalus, the republic claimed this iſland, as well as his other dominions, in virtue of his laſt will.

Andros is now ſubject to the Turks; and contains a town of the ſame name, with a great many villages. It is the moſt fruitful iſland in all the Archipelago, and yields a great quantity of ſilk. There are ſaid to be about 6000 inhabitants, beſides thoſe of the villages Arni and Amoldeos, who are about two hundred, have a different language and cuſtoms, and are called *Albanois.* There are ſeven monaſteries, a great number of churches, and a cathedral for the biſhops of the Roman catholic perſuaſion; but moſt of the inhabitants are of the Greek communion. The Jeſuits had a houſe and a church in this iſland; but they were forced to quit them long ago. Here are ſome delightful valleys; but the air is bad, and the water of the city worſe. The women would be agreeable enough, if it was not for their dreſs, which is very unbecoming; for they ſtuff out their clothes without the leaſt regard to their ſhape: but the Albaneſe women make a much better appearance. The peaſants make wicker-baſkets, wherewith they ſupply the greateſt part of the Archipelago. They have all ſorts of game in the woods and mountains, but know not how to take them for want of guns. Their principal food is goats fleſh; for there is no fiſh to be met with on their coaſts. When they are ſick, they are obliged to let the diſeaſe take its natural courſe, having neither phyſician nor ſurgeon on the iſland. A cadi, aſſiſted by a few of the principal perſons of the iſland, has the management of civil affairs, and his reſidence is in the caſtle: an aga, who preſides over the military force, lives in a tower without the city. About two miles from the preſent town are ſtill to be ſeen the ruins of a ſtrong wall with the fragments of many columns, chapiters, baſes, broken ſtatues, and ſeveral inſcriptions, ſome of which mention the ſenate and people of Andros, and the prieſts of Bacchus; from which it is probable that this was the ſite of the ancient city. E. Long. 25. 30. N. Lat. 37. 50.

ANDROS (anc. geog.), an iſland in the Iriſh ſea (Pliny), called *Hedros* by Ptolemy: Now *Bardſey*, diſtant about a mile from the coaſt of North Wales.

ANDROSACE: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 21ſt order, *Preciæ.* The eſſential characters are, The *male* calyx is five-leaved; the corolla is five-petal'd; the ſtamina are five, inſerted on the rudiment of the ſtylus: The *female* calyx is five-leav'd; the corolla is wanting; the ſtyli are three; the capſule is trilocular; the ſeeds are two. Of this genus Dr Linnæus reckons ſix.

Species. 1. The maxima grows naturally in Auſtria and Bohemia, among the corn. It hath broad leaves, which ſpread near the ground; from the centre of theſe the footſtalks ariſe, which are terminated by an umbel of white flowers like thoſe of the auricula. Theſe appear in April and May, and the ſeeds ripen in June; ſoon after which the plants periſh. 2. The ſeptentrionalis, villoſa, carnea, and lactea, grow naturally on the Alps and Helvetian mountains, as alſo in Siberia. They are much ſmaller than the former, ſeldom growing more than three inches high. Of the other ſpecies, called the *elongata*, we have no particular deſcription.

Culture. Theſe plants are propagated by ſeeds, which ſhould be ſown ſoon after they are ripe, otherwiſe they ſeldom come up the ſame year. If permitted to ſcatter, they will grow better than when they are ſown.

ANDRUM, a kind of hydrocele, to which the people of Malabar are very ſubject.—Its origin is derived from the vitious quality of the country waters, impregnated

nated with corrofive muriatic falts, the fource of moft other difeafes that infect the Malabarians. Its figns, or fymptoms, are an eryfipelas of the fcrotum, returning every new moon, by which the lymphatics, being eroded, pour a ferous faline humour into the cavity of the fcrotum. The andrum is incurable; thofe once feized with it have it for life: but it is not dangerous, nor very troublefome, to thofe ufed to it; tho' fometimes it degenerates into an hydrofarcocele. The method of prevention is by a heap of fand fetched from a river of the province Mangatti, and ftrowed in the wells. This is practifed by the rich. As to the cure, they have only a palliative one; which is by incifion, or tapping, and drawing off the water from the fcrotum, once in a month or two.

ANDRYALA, DOWNY SOW-THISTLE: A genus of the polygamia æqualis order, belonging to the fyngenefia clafs of plants; and in the natural method ranking under the 49th order, *Compofitæ-femiflofculus*. The effential characters are: The receptacle is villous; the calyx is many-parted, fubequal, and rounded; and the pappus is fimple and feffile.

Species. 1. The integrifolia is an annual plant, growing naturally in the fouth of France, Spain, and Italy. It rifes to the height of a foot and an half, with woolly branching ftalks. The flowers are produced in fmall clufters at the top of the ftalks. They are yellow, and like thofe of the fow-thiftle; fo do not make any great appearance. 2. The ragufina is a native of the Cape of Good Hope. The leaves are extremely white, and much indented on their edges. The flower-ftalks grow about a foot high, having fmall clufters of yellow flowers, which appear in July. The feeds fometimes ripen in Britain, but not always. 3. The lanata is a native of Sicily and of the country round Montpelier. The lower leaves are indented and woolly, but thofe on the ftalks are entire. It feldom rifes more than a foot high, fupporting a few yellow flowers at top. 4. The finuata grows in Spain and Portugal: the leaves are broader, longer, and more downy, than either of the other forts; the flower-ftalks rifing more than a foot high. They branch into feveral footftalks, each fuftaining one large yellow flower, fhaped like thofe of hawk-weed, which are fucceeded by oblong black feeds covered with down.

Culture. All thefe plants are eafily propagated by feeds, which fhould be fown in autumn, where they are to remain, and will require no other culture than to thin them where they are too clofe, and to keep them free from weeds. The third fort muft have a light dry foil, or it will not live in this country.

ANDUXAR, a city in the province of Andalufia, in Spain, feated on the Guadalquiver. It is pretty large, indifferently rich, and defended by a good caftle. It is adorned with handfome churches and feveral religious houfes, and inhabited by many families of high rank. The land about it abounds in corn, wine, oil, honey, and fruit of all forts; and the inhabitants carry on a confiderable trade in filk. W. Long. 4. 2. N. Lat. 37. 45.

ANDUZE, a town of France in lower Languedoc, feated on the river Gardon. It carries on a confiderable trade in ferges and woollen cloth. E. Long. 3. 42. N. Lat. 43. 39.

ANEAU (Bartholomew), a native of Bourges in France, a man of eminent learning in the 16th century, educated under Melchior Volmar. He was profeffor at Lyons, where he propagated the doctrines of the Reformation fecretly for a long time: but on the feftival of the Holy Sacrament 1565, as the proceffion was paffing on towards the college, there was a large ftone thrown from one of the windows upon the Hoft and prieft who carried it. The people, enraged at this, broke into the college, and affaffinated Mr Aneau, whom they imagined to have been the occafion, and the college itfelf was fhut up next day by order of the city.

ANECDOTE, ANECDOTA, a term ufed by fome authors, for the titles of *Secret Hiftories;* but it more properly denotes a relation of detached and interefting particulars. The word is Greek, ανεκδοτα, q. d. *things not yet known* or *hitherto kept fecret*. Procopius gives this title to a book which he publifhed againft Juftinian and his wife Theodora; and he feems to be the only perfon among the ancients who has reprefented princes fuch as they are in their domeftic relation.—Varillas has publifhed Anecdotes of the Houfe of Medicis.

ANECDOTES is alfo an appellation given to fuch works of the ancients as have not yet been publifhed. In which fenfe, M. Muratori gives the name *Anecdota Græca* to feveral writings of the Greek fathers, found in the libraries, and firft publifhed by him.—F. Martene has given a *Thefaurus Anecdotarum Novus*, in folio, 5 vols.

ANEE, in commerce, a meafure for grain, ufed in fome provinces of France. At Lyons, it fignifies alfo a certain quantity of wine, which is the load an afs can carry at once: which is fixed at 80 Englifh quarts, wine-meafure.

ANEMOMETER, in mechanics, implies a machine for meafuring the force and velocity of the wind.

Various machines of this kind have been invented at different times, and by different perfons. The following has been often experienced, and found to anfwer the intention.

An open frame of wood, ABCDEFGHI *, is fupported by the fhaft or arbor I. In the two crofs-pieces H K, L M, is moved a horizontal axis QM, by means of the four fails, *ah*, *cm*, *Of*, *gh*, expofed to the wind in a proper manner. Upon this axis is fixed a cone of wood, MNO; upon which, as the fails move round, a weight R, or S, is raifed by a ftring round its fuperfices, proceeding from the fmaller to the larger end N O. Upon this larger end or bafe of the cone, is fixed a rocket wheel *k*, in whofe teeth the click X falls, to prevent any retrograde motion from the depending weight.

* Plate XXIX. fig. 3.

The ftructure of this machine fufficiently fhows that it may be accommodated to eftimate the variable force of the wind; becaufe the force of the weight will continually increafe as the ftring advances on the conical furface, by acting at a greater diftance from the axis of motion; confequently, if fuch a weight be added on the fmaller part M, as will juft keep the machine in equilibrio in the weakeft wind, the weight to be raifed, as the wind becomes ftronger, will be increafed in proportion, and the diameter of the cone N O may

 be ſo large in compariſon to that of the ſmaller end at M, that the ſtrongeſt wind ſhall but juſt raiſe the weight at the greater end.

If, for example, the diameter of the axis be to that of the baſe of the cone N O as 1 to 28; then, if S be a weight of one pound at M on the axis, it will be equivalent to 28 pounds when raiſed to the greater end: if therefore, when the wind is weakeſt, it ſupports one pound on the axis, it muſt be 28 times as ſtrong to raiſe the weight to the baſe of the cone. If therefore a line of ſcale of 28 equal parts be drawn on the ſide of the cone, the ſtrength of the wind will be indicated by that number on which the ſtring reſts.

ANEMONE, WIND-FLOWER: A genus of the polygnia order, belonging to the polyandria claſs of plants; and, in the natural method, ranking under the 26th order, *Multiſilique*. It has its name from the Greek ανεμος, ſignifying the *wind;* becauſe the flower is ſuppoſed not to open unleſs the wind blows.—The characters are: There is no *calyx:* The *corolla* conſiſts of petals of two or three orders, three in each ſeries, oblongiſh: The ſtamina conſiſt of numerous capillary filaments; the antheræ didymous and erect. The *piſtillum* has numerous germina collected into a head; the ſtyli are pointed; the ſtigmata obtuſe: There is no *pericarpium;* the receptaculum is globular: The *ſeeds* are very numerous.

Of this genus Dr Linnæus enumerates 21 ſpecies; but thoſe valuable on account of the beauty of their flowers are only the following. 1. The nemoroſa, which grows wild in the woods in many parts of Britain, where it flowers in April and May. The flowers are white, purple, or reddiſh purple, ſometimes ſingle, and ſometimes double, ſo that they make a pretty appearance. 2. The appennina is likewiſe a native of Britain, growing in woods. The flowers of this ſpecies, like the laſt, are ſometimes ſingle, and ſometimes double; their colours are white, blue, or violet. They appear in April. 3. The coronaria. 4. The hortenſis. Theſe two are natives of the Levant, particularly of the Archipelago iſlands, where the borders of the fields are covered with them of the moſt beautiful colours. When they grow wild, the flowers are commonly ſingle; but by culture they are greatly improved: they become large and double, making ſome of the greateſt ornaments of gardens. Their principal colours are red, white, purple, and blue; ſome of them are finely variegated with red, white, purple, and many intermediate ſhades of theſe colours.

Culture. The firſt and ſecond ſorts may be propagated by taking up their roots when the leaves decay, and tranſplanting them in wilderneſſes, where they will thrive and increaſe greatly, if they are not diſturbed. The two laſt ſorts require a good deal of care, and ample directions for their culture.—The ſoil in which theſe flowers will thrive extremely, may be compoſed in the following manner: Take a quantity of freſh untried earth (from a common or ſome other paſture land) that is of a light ſandy loam or hazel mould, obſerving not to take it above ten inches deep below the ſurface; and if the turf be taken with it, the better, provided it hath time to rot thoroughly before it is uſed: mix this with a third part of rotten cow-dung, and lay it in a heap, keeping it turned over at leaſt once a month for eight or ten months, the better to mix it, and rot the dung and turf, and to let it have the advantages of the free air. In doing this work, be careful to rake out all great ſtones, and break the clods; but by no means ſift or ſcreen the earth, which has been found very hurtful to many ſorts of roots. This earth ſhould be mixed twelve months before it is uſed, if poſſible: but if conſtrained to uſe it ſooner, it muſt be the oftener turned over, to mellow and break the clods; obſerving to rake out all the parts of the green ſwaird that are not quite rotten, before it is uſed, as they would be prejudicial to the roots if ſuffered to remain. The beginning of September is a proper ſeaſon to prepare the beds for planting, which (if in a wet ſoil) ſhould be raiſed with this ſort of earth ſix or eight inches above the ſurface of the ground, laying at the bottom ſome of the rakings of the heap to drain off the moiſture; but, in a dry ſoil, three inches above the ſurface will be ſufficient: this compoſt ſhould be laid at leaſt two feet and a half thick, and in the bottom there ſhould be about four or five inches of rotten neats dung, or the rotten dung of an old melon or cucumber bed. The beds muſt be laid (if in a wet ſoil) a little round, to ſhoot off the water; but in a dry one, nearer to a level. In wet land, where the beds are raiſed above the ſurface, it will be proper to fill up the paths between them, in winter, either with rotten tan or dung, to prevent the froſt from penetrating into the ſides of the beds, which otherwiſe may deſtroy their roots. The earth ſhould be laid in the beds at leaſt a fortnight or three weeks before the roots are planted, and a longer time would be yet better, that it may ſettle; and when they are planted, ſtir the upper part of the ſoil about ſix inches deep, with a ſpade; then rake it even and ſmooth, and with a ſtick draw lines each way of the bed at ſix inches diſtance, ſo that the whole may be in ſquares, that the roots may be planted regularly: then with three fingers make a hole in the centre of each ſquare, about three inches deep, laying therein a root with the eye uppermoſt; and when the bed is finiſhed, with the head of a rake draw the earth ſmooth, ſo as to cover the crown of the roots about two inches thick.

The beſt ſeaſon for planting theſe roots, if for forward flowers, is about the latter end of September, and for thoſe of a middle ſeaſon any time in October: but obſerve to perform this work, if poſſible, at or near the time of ſome gentle ſhowers; for if planted when the ground is perfectly dry, and there ſhould no rain fall for three weeks or a month after, the roots will be very apt to grow mouldy upon the crown; and if once they get this diſtemper, they ſeldom come to good after.

As all the fine varieties of theſe flowers were firſt obtained from ſeeds, ſo no good floriſt that hath garden-room ſhould neglect to ſow them; in order to which, he ſhould provide himſelf with a quantity of good roots of the ſingle (or what the gardeners call *poppy*) anemonies, of the beſt colours, and ſuch as have ſtrong ſtems and large flowers, but eſpecially ſuch as have more leaves than common, and alſo other good properties: theſe ſhould be planted early, that they may have ſtrength to produce good ſeeds, which will be ripe in three weeks or a month's time after the flowers are paſt; when the ſeeds muſt be carefully gathered, otherwiſe they will be blown away in a ſhort time, as being incloſed in a downy ſubſtance. You muſt preserve this feed till the beginning of Auguſt, when you may either

ther sow it in pots, tubs, or a well-prepared bed of light earth: in the doing of it you must be careful not to let your seeds be in heaps; to avoid which, the best method is to mix them with a little fine sand, and, when sown, gently streak the bed with a strong hair-brush.

In about two months after sowing, the plants will begin to appear, if the season has proved favourable. The first winter after their appearing above ground, they are subject to injuries from hard frosts, or too much wet, against both of which you must equally defend them: for the frost is very apt to loosen the earth, so that the young plants are often turned out of the ground, after which a small frost will destroy them; and too much wet often rots their tender roots, so that all your former trouble may be lost in a short time for want of care in this particular: nor is any thing more destructive to those tender plants than the cold black frosts and winds of February and March, from which you must be careful to defend them, by placing a low reed-fence on the north and east sides of the bed, which may be moveable, and only fastened to a few stakes to support it for the present, and may be taken quite away as the season advances, or removed to the south and west sides of the bed, to screen it from the violence of the sun, which often impairs these plants when young. As the spring advances, if the weather should prove dry, you must gently refresh them with water, which will greatly strengthen your roots; and when the green leaves are decayed, if your roots are not too thick to remain in the same bed another year, you must clear off all the weeds and decayed leaves from the bed, and sift a little more of the same prepared good earth, about a quarter of an inch thick over the surface, and observe to keep them clear from weeds during the summer season, and at Michaelmas repeat the same earthing; but as these roots so left in the ground will come up early in the autumn, the beds should be carefully covered in frosty weather, otherwise their leaves will be injured, whereby the roots will be weakened, if not destroyed. If your roots succeed well, many of them will flower the second year, when you may select all such as you like, by marking them with a stick: but you should not destroy any of them till after the third year, when you have seen them blow strong, at which time you will be capable to judge of their goodness; for until the roots have acquired strength, the flowers will not show themselves to advantage.

The single (or poppy) anemonies will flower most part of the winter and spring, when the seasons are favourable, if they are planted in a warm situation, at which time they make a fine appearance; therefore deserve a place in every flower-garden, especially as they require little culture. There are some fine blue colours amongst these single anemonies, which, with the scarlets and reds, make a beautiful mixture; and as these begin flowering in January or February, when the weather is cold, they will continue a long time in beauty, provided the frost is not too severe, or if they are covered with mats. The seeds of these are ripe by the middle or end of May; and must be gathered daily as they ripen, otherwise they will be soon blown away by the winds.

Horned cattle, when removed from the higher grounds into woods and woody pastures, frequently eat the wood-anemone; and, according to Linnæus and Gunner, many observations have proved that it causes the bloody flux among them.

Sea-Anemone. See *Animal-Flower.*

ANEMOSCOPE, a machine that shows either the course or velocity of the wind. (See also the article *Wind-Gauge.*)

The machine which shows the course of the wind, or from what point of the compass it blows, consists of an index moving about an upright circular plate, like the dial of a clock, on which the 32 points of the compass are drawn instead of the hours. The index, which points to the divisions on the dial, is turned by a horizontal axis, having a trundle-head at its external extremity. This trundle-head is moved by a cog-wheel on a perpendicular axis; on the top of which a vane is fixed, that moves with the course of the wind, and puts the whole machine in motion. The whole contrivance is extremely simple; and nothing required in the construction, but that the number of cogs in the wheel, and rounds in the trundle head, be equal; because it is necessary, that, when the vane moves entirely round, the index of the dial also make a complete revolution.—An anemoscope of this kind is placed in one of the turrets of the queen's palace. The anemoscope, calculated for indicating the force or velocity of the wind, is the same with what most writers call an *anemometer;* and we have accordingly described one of those machines under that article. We shall here add another, contrived by the late Mr Pickering, and published in the *Philosophical Transactions*, N° 473. This anemoscope is a machine four feet and a quarter high, consisting of a broad and weighty pedestal, a pillar fastened into it, and an iron axis of about half an inch diameter fastened into the pillar. Upon this axis turns a wooden tube; at the top of which is placed a vane, of the same materials, 21 inches long, consisting of a quadrant, graduated, and shod with an iron rim, notched to each degree; and a counterpoise of wood, as in the figure, on the other. Through the centre of the quadrant runs an iron pin, upon which are fastened two small round pieces of wood, which serve as moveable radii to describe the degrees upon the quadrant, and as handles to a velum or sail, whose pane is one foot square, made of canvas, stretched upon four battens, and painted. On the upper batten, next to the shod rim of the quadrant, is a small spring which catches at every notch corresponding to each degree, as the wind shall, by pressing against the sail, raise it up; and prevents the falling back of the sail, upon lessening of the force of the wind. At the bottom of the wooden tube, is an iron index, which moves round a circular piece of wood fastened to the top of the pillar on the pedestal, on which are described the 32 points of the compass. The figure of this machine is given on Plate XXIX. fig. 4. where *a* is the pedestal; *b*, the pillar on which the iron axis is fitted; *c*, the circle of wood, on which are described the 32 points of the compass; *e*, the wooden tube upon its axis; *f*, the velum; *g*, the graduated quadrant; *h*, the counterpoise of the vane. The adjoining figure represents the velum, which takes off: *a* is the plane of the velum; *b*, the spring; *c c*, the wooden radii; *d*, *d*, the holes through which the pin in the centre of the quadrant goes. Its uses are the following.

1. Ha-

1. Having a circular motion round the iron axis, and being furnished with a vane at top, and index at the bottom, when once you have fixed the artificial cardinal points, described on the round piece of wood on the pillar, to the same quarters of the heavens, it gives a faithful account of that quarter from which the wind blows. 2. By having a velum or sail elevated by the wind along the arch of the quadrant to an height proportionable to the power of the column of wind pressing against it, the relative force of the wind, and its comparative power, at any two times of examination, may be accurately taken. 3. By having a spring fitted to the notches of the iron with which the quadrant is shod, the velum is prevented from returning back upon the fall of the wind; and the machine gives the force to the highest blast, since the last time of examination, without the trouble of watching it.

The ingenious contriver of this machine tells us, that he carefully examined what dependence may be had upon it, during the storms of February 1743-4, and found that it answered exceeding well; for that, in such winds as the sailors call *violent storms*, the machine had six degrees to spare for a more violent gust, before it comes to a horizontal position. It is certainly to be depended upon in ordinary-weather, the velum being hung so tenderly as to feel the most gentle breeze. There is however reason to fear, that the exposing the anemoscope to all winds for a continuance, must disorder it, especially irregular blasts and squalls. It may not therefore be amiss, in violent weather, for the observer to take the tube with its vane and velum in his hand, in order to know the force of the wind; and, when he has finished his observations, to carry the machine into the house, till the violence of the storm is abated, when it may be replaced in its former situation.

ANETHUM, DILL and FENNEL: A genus of the digynia order, belonging to the pentandria class of plants; and, in the natural method, ranking under the 45th order, *Umbellatæ*. The essential characters are: The fruit is oval, compressed, striated; and the petals (five) are involute, entire, and very short.

Species. 1. The graveolens, or dill, is an annual plant: the root is long, slender, and white: the leaves are divided into a multitude of fine, long, narrow segments like those of fennel, but of a bluish green colour, and less strong smell. The stalk is round and firm, growing to the height of four feet, with yellow flowers in moderately large umbels. 2. The feniculum, or fennel; of which there are two varieties, the common and the sweet. The sweet fennel is smaller in all its parts than the common, except the seeds, which are considerably larger. The seeds of the two sorts differ likewise in shape and colour; those of the common are roundish, oblong, flattish on one side, and protuberant on the other, of a dark almost blackish colour; those of the sweet are longer, narrower, not so flat, generally crooked, and of a whitish or pale yellowish colour. Both sorts are cultivated in our gardens: the common is a perennial plant: the sweet fennel perishes after it has given seed; nor do its seeds come to such perfection in this climate as those which we receive from Germany.

Medicinal Uses. 1. Of the first species, *dill*, only the seeds are used. They are of a pale yellowish colour, in shape nearly oval, convex on one side, and flat on the other. Their taste is moderately warm and pungent; their smell aromatic, but not of the most agreeable kind. Several preparations of them are kept in the shops. They are recommended as a carminative, in flatulent colics, proceeding from a cold cause or a viscidity of the juices.—2. Of *fennel* both the seeds and roots are used in medicine. The seeds of both the fennels have an aromatic smell, and a moderately warm pungent taste: those of the sweet fennel are in flavour most agreeable, and have also a considerable degree of sweetness; hence our colleges have directed the use of these only. They are ranked among the four greater hot seeds, and not undeservedly looked upon as good stomachics and carminatives. A simple water is prepared from them in the shops; they are ingredients also in the compound spirit of juniper, and some other officinal compositions. The root is far less warm, but has more of a sweetish taste, than the seeds: it is one of the five roots called *openers*; and has sometimes been directed in aperient apozems. Boerhaave says, that this root agrees in taste, smell, and medical qualities, with the celebrated *ginseng* of the Chinese; from which, however, it appears to be very considerably different.—The leaves of fennel are weaker than either the roots or seeds, and have very rarely been employed for any medicinal use.

ANEURISM, in surgery, a throbbing tumor, distended with blood, and formed by a dilatation or rupture of an artery. See SURGERY-*Index*.

ANGARI, or ANGARII, in antiquity, denote public couriers, appointed for the carrying of messages. The ancient Persians, Budæus observes, had their αγγαρειον δρομημα; which was a set of couriers on horseback, posted at certain stages or distances, always in readiness to receive the dispatches from one, and forward them to another, with wonderful celerity, answering to what the moderns call *posts*, q. d. *positi*, as being posted at certain places or stages.—The angari were also called by the Persians *astandæ*; by the Greeks ημεροδρομοι, on account of the long journeys they made in one day, which according to Suidas amounted not to less than 1500 stadia.

ANGARIA, in Roman antiquity, a kind of public service imposed on the provincials, which consisted in providing horses and carriages for the conveyance of military stores, and other public burdens. It is sometimes also used for a guard of soldiers, posted for the defence of a place. In a more general sense, it is used for any kind of oppression or services performed thro' compulsion.

ANGAZYA, one of the Comorra islands, lying between the north end of Madagascar and the coast of Zanguebar in Africa, from Lat. 10° to 15° S. It is inhabited by Moors, who trade with divers parts of the continent, in cattle, fruits, and other commodities of the island; which they exchange for callicoes and other cotton cloths. The houses here are built of stone, and lime made of calcined oyster-shells; with which the walls and roof are plastered in a very elegant manner. The government of Angazya is a pure aristocracy; the island being subject to 10 lords, who have all the title of *Sultan*. The people are very careful of their women; never permitting strangers to see them, without permission from a sultan, or an order which the

the ſtranger brings with him. Many of them read and write Arabic with great facility; and ſome even underſtand Portugueſe, which they learn from their intercourſe with Moſambique, whither they trade in veſſels of 40 tons burthen.

ANGEIOTOMY, in ſurgery, implies the opening a vein or artery, as in bleeding; and conſequently includes both arteriotomy and phlebotomy.

ANGEL, a ſpiritual intelligent ſubſtance, the firſt in rank and dignity among created beings. The word *Angel* is Greek, and ſignifies a *Meſſenger:* the Hebrew מלאך ſignifies the ſame thing. The angels are in Daniel (chap. iv. ver. 13, &c.) called ישים, or *Watchers*, from their vigilance: for the ſame reaſon they are, in the remains we have of the prophecy attributed to Enoch, named *Egregori;* which word imports the ſame in Greek.

Angels, therefore, in the proper ſignification of the word, do not import the nature of any being, but only the office, to which they are appointed, eſpecially by way of meſſage, or intercourſe between God and his creatures; in which ſenſe they are called the *miniſters of God*, who do his pleaſure, and *miniſtring ſpirits* ſent forth to miniſter for them who ſhall be heirs of ſalvation. That there are ſuch beings as we call *angels*, that is, certain permanent ſubſtances, inviſible, and imperceptible to our ſenſes, endued with underſtanding and power ſuperior to that of human nature, created by God, and ſubject to him as the ſupreme Being; miniſtring to his divine providence in the government of the world by his appointment, and more eſpecially attending the affairs of mankind; is a truth ſo fully atteſted by Scripture, that it cannot be doubted. Nay, the exiſtence of ſuch inviſible beings was generally acknowledged by the ancient heathens, though under different appellations: the Greeks called them *dæmons;* and the Romans *genii*, or *lares*. Epicurus ſeems to have been the only one among the old philoſophers who abſolutely rejected them. Indeed, the belief of middle intelligences influencing the affairs of the world, and ſerving as miniſters or interpreters between God and man, is as extenſive as the belief of a God; having never, ſo far as we know, been called in queſtion by thoſe who had any religion at all.

When created.

The creation of angels is not indeed expreſsly mentioned by Moſes in the firſt of Geneſis, yet it is generally conſidered by judicious expoſitors as implied. The reaſon why the ſacred hiſtorian is ſilent on this ſubject, is ſuppoſed by Berrington to be the natural proneneſs of the gentile world, and even of the Jews, to idolatry*. And it is thought, if they worſhipped mere material elements, which was the caſe, much more might they be inclined to worſhip ſuch ſuperior and ſublime beings as angels. But a better reaſon is perhaps given by other writers, viz. that this firſt hiſtory was purpoſely and principally for information concerning the viſible world; the inviſible, of which we know but in part, being reſerved for a better life †.

On what day they were created has been matter of conjecture. It is a point on which learned men have differed. The Socinians, indeed, hold, ſays Biſhop Hopkins‡, that it was long before the account given by Moſes, but it muſt have been within the ſix days creation; becauſe, as we are informed, that within this ſpace God made heaven and earth, and all things that are therein. All the writers that we have ſeen on this ſubject, think they were included in the firſt day's work, when the heavens were framed.

* On the Creation, p. 81. See alſo Severianus on the Creation.

† Aſſembly's Annot. on Gen i. 30.

‡ Works, p. 505.

It has been thought by ſome perſons, that the words of Job, "When the morning ſtars ſang together, and all the ſons of God ſhouted for joy," militate againſt the creation of angels within the ſix days. About the meaning of theſe words, however, expoſitors are not agreed; but admitting that they refer literally to angels, Dr Lightfoot, Caryl, and others, ſee no difficulty in the paſſage. The Doctor thinks they were created on the firſt day, with the heavens; and that they were ſpectators of God's works in the other parts of creation, and praiſed and magnified the Lord for his works all along; ſinging and ſhouting when God laid the foundation of the earth, as the Jews did at the laying the foundation of the temple, Ezra iii.

On a ſubject of this nature, it would be imprudent to *indulge* a ſpirit of conjecture: Scripture is the only ſtandard by which truth and error can be tried, and to this we muſt ultimately appeal. It is acknowledged that Moſes has not expreſsly mentioned angels by name; yet, as we have remarked, their creation is undoubtedly implied: for the heavens muſt include all that are in them; and therefore it is that the divine penman ſays, in the concluſion of his narrative, "Thus the heavens and the earth were finiſhed, and *all* the hoſt of them." Of the *hoſts* of heaven, the angels muſt form a conſiderable part; they are expreſsly called the *heavenly hoſt*, and the *armies of heaven*, Dan. iv. 35. Luke ii. 13. And if divine authority be admitted as deciſive, the reaſons adduced by Jehovah for the ſanctification of a ſabbath, demonſtrate that they did not exiſt previous to the creation of the heavens. It is, ſurely, aſſerted with propriety, that in *ſix days* the Lord made heaven and earth, the ſea, and ALL that *in them is*. Similar to which is a declaration of the divine hiſtorian relating to the ſame fact.—"And God bleſſed the ſeventh day and ſanctified it; *becauſe* that in it he had reſted from ALL his work which God created and made," Gen. ii. 3. Now if angels exiſted prior to the ſix days of creation, the language of Moſes is far from being accurate and intelligible; and eſpecially when it is conſidered that the obſcurity might have been removed by adding, "from all the work which God had *then* created and made."

But if angels were created before the heavens, where could they exiſt? For, as the learned Gill‖ has remarked, "though angels have no bodies, and ſo are not in place circumſcriptively; yet as they are creatures, they muſt have an *ubi*, a ſomewhere in which they are definitively; ſo that they are here, and not there, and much leſs everywhere: Now where was there an *ubi*, a ſomewhere, for them to exiſt in, before the heavens and the earth were made? It is moſt reaſonable, therefore, to conclude, that as God prepared an habitation for all the living creatures before he made them; as the ſea for the fiſhes, the expanſe, or air, for the fowls, and the earth for men and beaſts; ſo he made the heavens firſt, and then the angels to dwell in them."

‖ Bod. Divin. vol. i. p. 422.

That this was the fact, will appear very evident, if the words of Moſes be impartially conſidered. "In the beginning (ſays he), God created the heavens and the earth;" which words muſt refer to either the beginning of *creation* or of *time:* if to the former, and angels previouſly exiſted, the language is neither *intel-*

ligible

Angel.

ligible nor conformable to *truth:* if to the latter, the difficulty remains; for what is time but the meaſure of created exiſtence. "Time (ſays the judicious Charnock*) began with the foundation of the world: before the beginning of the creation and the beginning of time, there could be nothing but eternity; nothing but what was uncreated, that is, nothing but what was without beginning." But if angels were in a pre-exiſtent ſtate, the hiſtorian's language is unaccountably ſtrange and inaccurate: for if the phraſe *in the beginning*, which is remarkably emphatical, refer to the creation of the heavens and the earth *only*, they are unhappily expreſſed; ſo expreſſed, indeed, as to convey no meaning to thoſe who conſider words as the vehicle of thought, and as intended to expreſs clearly to others the meaning of the writer. For the *natural obvious* ſenſe is as follows—"In the beginning of the creation of the heavens and the earth, God created the heavens and the earth;" which language is not only a departure from that perſpicuity and preciſion which diſtinguiſh all his narrations, but entirely irrational and abſurd.

* Works, vol. i. 112.

That the words *in the beginning* refer to the firſt creation, cannot be doubted, if it be remembered that Jehovah himſelf founds a claim to *eternity* on this very ground: "Before the day was, I am he."—"Before the mountains were brought forth, or ever thou hadſt formed the earth and the world, even from everlaſting to everlaſting, thou art God." Iſa. xliii. 13. Pſ. ix. 2. See alſo Prov. viii. 22, 23, &c. Now there could be no propriety in this kind of reaſoning, if angels or any other creature exiſted before the creation of the world, becauſe all claims to eternity from ſuch premiſſes would apply even to Gabriel as well as to Jehovah. "Before the world was," is, in Scripture language, a phraſe always expreſſive of eternity; and on this principle the evangeliſt John aſſerts the divinity of Jeſus Chriſt in the firſt chapter of his hiſtory. For this purpoſe he alludes to the words of Moſes, and introduces his divine maſter to notice by celebrating the firſt act of his creative power. "In the beginning (ſays he) was the Word;" that is, Dr Doddridge remarks §, before the foundation of the world, or the firſt production of any creature: and Dr Sherlock ‡ is clearly of opinion, that the words, in their moſt common and uſual acceptation, ſignify the firſt creation of all things, and are a demonſtration of the divinity of Chriſt ‡. Of the ſame mind was Dr Owen. He ſays, that if the phraſe *beginning* does not abſolutely and formally expreſs *eternity*, yet it doth a pre-exiſtence to the whole creation, which amounts to the ſame thing; for nothing can pre-exiſt before all creatures but the nature of God, which is eternal, unleſs we ſuppoſe a creature before the creation of any. But what is meant by this expreſſion is fully declared by other paſſages of Scripture: "I was ſet up from everlaſting, before the *beginning*, or ever the earth was;" "Glorify thou me with thine own ſelf, with the glory which I had with thee before the world was;" both which paſſages not only explain the text, but undeniably prove the pre-exiſtence of Chriſt the ſon of God *. It ſhould be remembered, that, in the paſſage under conſideration, the Evangeliſt's argument for the *divinity* of Jeſus Chriſt is grounded on his pre-exiſting the creation of the world; and it is conſequently aſſerted, that he is the creator of all things: but if angels had a being before the period to which he alludes, the argument loſes all its force, and no more proves the divinity of Chriſt than the divinity of an angel (A).

§ Family Expoſitor.

‡ Script. Proof. of Chriſt's Divin. p. 129. See alſo Whitby on John i. 1.

* On the Trinity, p. 43.

If, therefore, the words of Moſes be impartially viewed in their obvious natural meaning, and compared with other paſſages of Scripture that relate to the ſame ſubject, we have no doubt but every unprejudiced mind will perceive, that as he intended to give a ſummary hiſtory of the creation of all things both in heaven and in earth, he has done it in language intelligible and accurate, and in terms ſufficiently explicit.

Their nature, power, employment, &c.

As to the nature of theſe beings, we are told, that they are ſpirits: but whether pure ſpirits diveſted of all matter, or united to ſome thin bodies, or corporeal vehicles, has been a controverſy of long ſtanding. Not only the ancient philoſophers, but ſome of the Chriſtian fathers were of opinion, that angels were cloathed with ethereal, or fiery, bodies, of the ſame nature with thoſe which we ſhall one day have when we come to be equal to them. But the more general opinion, eſpecially of later times, has been, that they are ſubſtances entirely ſpiritual, though they can at any time aſſume bodies, and appear in human or other ſhapes.

That the angelical powers and abilities vaſtly excel thoſe of man, cannot be denied, if we conſider, that their faculties are not clogged or impeded, as ours are, by any of thoſe imperfections which are inſeparable from corporeal being: ſo that their underſtandings are always in perfect vigour; their inclinations regular; their motions ſtrong and quick; their actions irreſiſtible by material bodies, whoſe natural qualities they can controul, or manage to their purpoſes, and occaſion either bleſſings or calamities, public or private, here below; inſtances of which are too numerous to mention.

Beſides their attendance on God, and their waiting and executing of his commands, they are alſo preſumed to be employed in taking care of mankind and their concerns: and that every man had ſuch a tutelar or guardian angel, even from his birth, was a firm belief and tradition among the Jews; and our Saviour himſelf ſeems to have been of the ſame ſentiment. The heathens were alſo of the ſame perſuaſion, and thought it a crime to neglect the admonitions of ſo divine a guide. Socrates publicly confeſſed himſelf to be under the direction of ſuch an angel, or dæmon, as ſeveral others have ſince done. And in this tutelar genius of each perſon they believed his happineſs and fortune depended. Every genius did his beſt for the intereſt of his client; and if a man came by the worſt, it was a ſign the ſtrength of his genius was inferior to that

(A) Of this Socinus and his followers were aware; and therefore artfully endeavoured to evade the force of the apoſtle's reaſoning, by interpreting the phraſe *in the beginning* either in a figurative ſenſe, or as referring to the beginning of John the Baptiſt's miniſtry. We will only ſubjoin, that we do not remember to have ſeen any writer deviate from the primary obvious meaning of the paſſage, who had not ſome hypotheſis to ſupport inimical to truth.

Angel. that of his opponent, that is, of an inferior order; and this was governed by chance. There were some genii, whose ascendent was so great over others, that their very presence entirely disconcerted them; which was the case of that of Augustus in respect of that of Marc Anthony; and for the same reason, perhaps, some persons have wit, and speak well, when others are absent, in whose presence they are confounded, and out of countenance. The Romans thought the tutelar genii of those who attained the empire, to be of an eminent order; on which account they had great honours shown them. Nations and cities also had their several genii. The ancient Persians so firmly believed the ministry of angels, and their superintendance over human affairs, that they gave their names to their months, and the days of their month; and assigned them distinct offices and provinces: and it is from them the Jews confess to have received the names of the months and angels, which they brought with them when they returned from the Babylonish captivity. After which, we find, they also assigned charges to the angels, and in particular the patronage of empires and nations; Michael being the prince of the Jews, as Raphael is supposed to have been of the Persians.

The Mahometans have so great a respect for the angels, that they account a man an infidel who either denies their existence, or loves them not. They believe them to be free from sin, enjoying the presence of God, to whom they are never disobedient: that they have subtile pure bodies, being created of light; and have no distinction of sexes, nor do they need the refreshment of food or sleep. They suppose them to have different forms and offices: that some adore God in several postures; others sing his praises, and intercede for men; some carry and encompass his throne; others write the actions of men, and are assigned guardians to them.

As the numbers of these celestial spirits are very great, it is likewise reasonable to believe that there are several orders and degrees among them; which is also confirmed by Scripture; whence some speculative men have distributed them into nine orders, according to the different names by which they are there called; and reduced those orders into three *hierarchies*, as they call them; to the first of which belong seraphim, cherubim, and thrones; to the second, dominions, virtues, and powers; and to the third, principalities, arch-angels, and angels. They imagine farther, that there are some who constantly reside in heaven; others who are ministers, and sent forth, as there is occasion, to execute the orders they receive from God by the former. The Jews reckon but four orders or companies of angels, each headed by an arch-angel; the first order being that of Michael, the second of Gabriel, the third of Uriel, and the fourth of Raphael: but though the Jews believe them to be four, yet it seems there were rather seven. The Persians also held, there were subordinate degrees among the angels. Angel.

Of the fallen angels. Although the angels were originally created perfect, good, and obedient, to their Master's will, yet some of them sinned, and kept not their first estate, but left their habitation; and so, of the most blessed and glorious, became the most vile and miserable of all God's creatures. They were expelled the regions of light, and cast down to hell, to be reserved in everlasting chains under darkness, until the day of judgment. With heaven they lost their heavenly disposition, which delighted once in doing good and praising God; and fell into a settled rancour against him, and malice against men: their inward peace was gone; all desire of doing good departed from them; and, instead thereof, revengeful thoughts and despair took possession of them, and created an eternal hell within them.

When, and for what offence, these apostate spirits fell from heaven, and plunged themselves into such an abyss of wickedness and wo, are questions very hard, if not impossible, to be determined by any clear evidence of Scripture. As to the time, we are certain that it could not be before the sixth day of creation; because on that day it is said, "God saw every thing that he had made, and behold it was very good:" but that it was not long after is very probable, as it must have preceded the fall of our first parents. Some have imagined it to have been after; and that carnality, or lusting to converse with women upon earth, was the sin which ruined them: an opinion (B) built on a mistaken interpretation of Scripture, as if angels were meant by *the sons of God* who are said to have begotten the mighty men of old on the daughters of men. Others have supposed, that the angels, being informed of God's intention to create man after his own image, and to dignify his nature by Christ's assuming of it, and thinking their glory to be eclipsed thereby, envied man's happiness, and so revolted: and with this opinion that of the Mahometans has some affinity; who are taught, that the devil, who was once one of those angels who are nearest to God's presence, and named *Azazil*, forfeited paradise for refusing to pay homage to Adam at the command of God. But on what occasion soever it first showed itself, pride seems to have been the leading sin of the angels; who, admiring and valuing themselves too much on the excellence of their nature and the height of their station, came at length to entertain so little respect for their Creator,

(B) This opinion seems to have been originally occasioned by some copies of the Septuagint, which, in the days of St Austin, had in this place *the angels of God*. Lactantius supposes the angels, who were guilty of this enormity, had been sent down by God to guard and take care of mankind; and being endued with free-will, were charged by him not to forfeit the dignity of their celestial nature, by defiling themselves with the corruptions of the earth; but that the devil at length enticed them to debauch themselves with women. He adds, that, being not admitted into heaven by reason of the wickedness into which they had plunged themselves, they fell down to the earth, and became the devil's ministers; but that those who were begotten by them, being neither angels nor men, but of a middle nature, were not received into hell, no more than their parents were into heaven. Hence arose two kinds of dæmons, celestial and terrestrial. These are unclean spirits, the authors of whatever evils are committed, and whose prince is the devil. From hence very probably proceeded the notions of *Incubi*, or dæmons who are supposed to have carnal knowledge of women.

Creator, as to be guilty of downright rebellion and apoſtaſy.

It is certain from Scripture, that theſe fallen angels was in great numbers, and that there were alſo ſome order and ſubordination preſerved among them; one eſpecially being conſidered as their prince, and called by ſeveral names, *Beelzebub*, *Satan*, or *Sammaël* by the Jews; *Ahrimam*, by the Perſians; and *Eblis*, by the Mahometans. Their conſtant employment is not only doing evil themſelves, but endeavouring by all arts and means to ſeduce and pervert mankind, by tempting them to all kind of ſin, and thereby bringing them into the ſame deſperate ſtate with themſelves.

Angel is likewiſe a title given to biſhops of ſeveral churches. In this ſenſe is St Paul underſtood by ſome authors, where he ſays, *Women ought to be covered in the church, becauſe of the angels.* The learned Dr Prideaux obſerves, that the miniſter of the ſynagogue, who officiated in offering up the public prayers, being the mouth of the congregation, delegated by them as their repreſentative, meſſenger, or angel, to ſpeak to God in prayer for them, was therefore, in the Hebrew language, called the *angel* of the church; and from thence the biſhops of the ſeven churches of Aſia are, by a name borrowed from the ſynagogue, called the *angels* of thoſe churches.

Angel, in commerce, the name of a gold coin formerly current in England. It had its name from the figure of an angel repreſented upon it, weighed four pennyweights, and was twenty-three and a half carats fine. It had different values in different reigns; but is at preſent only an imaginary ſum, or money of account, implying, ten ſhillings.

Angel-Fiſh, in ichthyology, a ſpecies of ſqualus. See Squalus.

ANGELIC, or Angelical, ſomething belonging to, or that partakes of, the nature of angels. We ſay an *angelical* life, &c. St Thomas is ſtyled the *angelical doctor*. The angelical ſalutation is called by the Romaniſts *Ave Maria*; ſometimes ſimply *angelus*.

Angelic Garment (Angelica veſtis), among our anceſtors, was a monkiſh garment, which laymen put on a little before their death, that they might have the benefit of the prayers of the monks. It was from them called *angelical*, becauſe they were called *angeli* who by theſe prayers *animæ ſaluti ſuccurrebant*. Hence, where we read the phraſe *monachus ad ſuccurrendum* in our old books, it muſt be underſtood of one who had put on the habit when he was at the point of death.

ANGELICA: A genus of the digynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 45th order, *Umbellatæ*. The eſſential characters are: The fruit is roundiſh, angled, ſolid, with reflected ſtyli; the corollæ are equal, and the petals incurvated.

Species. 1. The ſativa, or common angelica, which is cultivated in gardens for medicinal uſe, and likewiſe for a ſweetmeat, grows naturally in the northern countries. The root of this ſpecies is brown, oblong, and an inch or two thick, fragrant, and acrid. The leaves are very large, compoſed of pinnated foliola, of an oblong oval figure, dentated at the edge, and the odd leaf at the end of the pinna lobated; the ſtalk is round, ſtriated, and as thick as a child's arm. The umbels are very large, and of a globoſe figure; the flowers very ſmall, and greeniſh. 2. The arch-angelica is a native of Hungary and Germany. The leaves are much larger than thoſe of the former, and the flowers are yellow. 3. The ſylveſtris grows naturally in moiſt meadows, and by the ſides of rivers, in many parts of Britain; ſo is ſeldom admitted into gardens. 4. The atro-purpurea canadenſis; 5. The lucida canadenſis: Theſe are natives of North America, but have neither beauty nor uſe.

Culture. The common angelica delights to grow in a moiſt ſoil: the ſeeds ſhould be ſown ſoon after they are ripe. When the plants come up about ſix inches high, they ſhould be tranſplanted very wide, as their leaves ſpread greatly. If they are planted on the ſides of ditches or pools of water, about three feet diſtance, they will thrive exceedingly.

Medicinal Uſes. For the purpoſes of medicine, Bohemia and Spain produce the beſt kinds of angelica. The London college direct the roots brought from Spain to be alone made uſe of. Angelica roots are apt to grow mouldy, and be preyed upon by inſects, unleſs thoroughly dried, kept in a dry place, and frequently aired. It is probable that the roots which are ſubject to this inconvenience might be preſerved, by dipping them in boiling ſpirit, or expoſing them to its ſteam, after they are dried.

All the parts of angelica, eſpecially the root, have a fragrant aromatic ſmell, and a pleaſant bitteriſh warm taſte, glowing upon the lips and palate for a long time after they have been chewed. The flavour of the ſeeds and leaves is very periſhable, particularly that of the latter, which, on being barely dried, loſe the greateſt part of their taſte and ſmell: the roots are more tenacious of their flavour, though even theſe loſe part of it upon keeping. The freſh root, wounded early in the ſpring, yields an odorous, yellow juice, which, ſlowly exſiccated, proves an elegant gummy reſin, very rich in the virtues of the angelica. On drying the root, this juice concretes into diſtinct moleculæ, which, on cutting it longitudinally, appear diſtributed in little veins: in this ſtate, they are extracted by pure ſpirit, but not by watery liquors.

Angelica is one of the moſt elegant aromatics of European growth, though little regarded in the preſent practice. The root, which is the moſt efficacious part, is uſed in the aromatic tincture; and the ſtalks make an agreeable ſweet-meat.

ANGELICS (Angelici), in church-hiſtory, an ancient ſect of heretics, ſuppoſed by ſome to have got this appellation from their exceſſive veneration of angels; and by others, from their maintaining that the world was created by angels.

Angelics is alſo the name of an order of knights, inſtituted in 1191, by Angelus Flavius Commenus emperor of Conſtantinople.

Angelics is alſo a congregation of nuns, founded at Milan in 1534, by Louiſa Torelli, counteſs of Guaſtalla. They obſerve the rule of St Auguſtine.

ANGELITES, in eccleſiaſtical hiſtory, a ſect of Chriſtian heretics, in the reign of the emperor Anaſtaſius, and the pontificate of Symmachus, about the year 494, ſo called from Angelium, a place in the city of Alexandria, where they held their firſt meetings. They were called likewiſe *Severites*, from one Severus, who was the head of their ſect; as alſo *Theodoſians*, from one

one among them named Theodoſius, whom they made pope at Alexandria. They held, that the perſons of the Trinity are not the ſame; that none of them exiſts of himſelf, and of his own nature; but that there is a common god or deity exiſting in them all, and that each is God, by a participation of this deity.

ANGELO (Michael.). There were five celebrated Italian painters of this name, who flouriſhed in the 16th and 17th centuries; but the two moſt diſtinguiſhed of them are theſe.—Firſt, Michael Angelo Buonarroti, who was a moſt incomparable painter, ſculptor, and architect, born in 1474, in the territory of Arezzi in Tuſcany. He was the diſciple of Dominico Ghirlandaio; and erected an academy of painting and ſculpture in Florence, under the protection of Lorenzo di Medicis; which, upon the troubles of that houſe, was obliged to remove to Bologna. About this time he made an image of Cupid, which he carried to Rome, broke off one of its arms, and buried the image in a place he knew would ſoon be dug up, keeping the arm by him. It was accordingly found, and ſold to Cardinal St Gregory for an antique; until Michael, to their confuſion and his own credit, diſcovered his artifice, and confirmed it by the deficient arm which he produced: it is rather unuſual for the manufacturers of antiques to be ſo ingenuous. His reputation was ſo great at Rome, that he was employed by pope Sixtus to paint his chapel; and by the command of Pope Paul III. executed his moſt celebrated piece *The laſt judgment*. He has the character of being the greateſt deſigner that ever lived; and it is univerſally allowed that no painter ever underſtood anatomy ſo well. He died immenſely rich at Rome, in 1564.—Secondly, Michael Angelo de Caravaggio, born at that village in Milan, in 1569. He was at firſt no more than a bricklayer's labourer: but he was ſo charmed with ſeeing ſome painters at work, that he immediately applied himſelf to the art; and made ſuch a progreſs in a few years, that he was admired as the author of a new ſtyle in painting. It was obſerved of Michael Angelo Buonarotti, that he was incomparable in deſigning, but knew little of colouring; and of Caravaggio, that he had as good a goût in colouring as he had a bad one in deſigning. There is one picture of his in the Dominican church at Antwerp, which Rubens uſed to call his maſter. It is ſaid of this painter, that he was ſo ſtrangely contentious, that the pencil was no ſooner out of his hand but his ſword was in it. He died in 1609.

ANGELO (St.) a ſmall but ſtrong town of Italy, in the Capitanata. There are ſeveral other towns and caſtles of the ſame name in Italy, and particularly the caſtle of St Angelo at Rome. E. Long. 15. 56. N. lat. 41. 43.

ANGELOS (LOS), a province of Mexico, the ancient republic of Tlaſcala, of which a city called *Tlaſcala* was once the capital, That city is now reduced to an inconſiderable village, and has given place to another called *Puebla des los Angelos*, or the city of Angels. It is ſituated in W. Long. 103. 12. and N. Lat. 19. 13. It was formerly an Indian town; but in 1530 was entirely abandoned by the natives, on account of the cruelties of the Spaniards. A ſucceeding viceroy of Mexico, by a milder treatment, recalled them; and the town is now exceedingly rich and populous, ſo as even to vie with Mexico itſelf in magnificence. It is ſituated on the river Zacatula, in a fine valley, about 25 leagues to the eaſtward of Mexico. In the middle is a beautiful and ſpacious ſquare, from whence run the principal ſtreets in direct lines, which are croſſed by others at right angles. One ſide is almoſt entirely occupied by the magnificent front of the cathedral; while the other three conſiſts of piazzas, under which are the ſhops of tradeſmen. The city is the ſee of a biſhop, ſuffragan to the archbiſhop of Mexico, and we may form a judgment of the wealth of the place by the revenue of the cathedral and chapter, which amounts to 300,000 pieces of eight annually. It muſt be remembered, however, that in all popiſh countries the wealth of the laity by no means bears the ſame proportion to that of the clergy, as in Britain, What contributes greatly to encreaſe the riches of this province is, that here is ſituated the city or Vera Cruz, the natural centre of all the American treaſures belonging to Spain. See VERA CRUZ.

ANGELOT, an ancient Engliſh gold coin, ſtruck at Paris, while under ſubjection to the Engliſh. It was thus called from the figure of an angel ſupporting the ſcutcheon of the arms of England and France. There was another coin of the ſame denomination ſtruck under Philip de Valois.

ANGELOT is alſo uſed in commerce to denote a ſmall, fat, rich ſort of cheeſe, brought from Normandy. Skinner ſuppoſes it to have been thus called from the name of the perſon who firſt made it up in that form, and perhaps ſtamped it with his own name. Menage takes it to have been denominated from the reſemblance it bears to the Engliſh coin called *angelot*. It is made chiefly in the Pays de Bray, whence it is alſo denominated *angelot de Bray*. It is commonly made in vats, either ſquare or ſhaped like a heart.

ANGER, a violent paſſion of the mind, conſiſting in a propenſity to take vengeance on the author of ſome real or ſuppoſed injury done the offended party.

Anger is either deliberative or inſtinctive; and the latter kind is raſh and ungovernable, becauſe it operates blindly, without affording time for deliberation or foreſight. Biſhop Butler very juſtly obſerves, that anger is far from being a ſelfiſh paſſion, ſince it is naturally excited by injuries offered to others as well as to ourſelves; and was deſigned by the Author of nature not only to excite us to act vigorouſly in defending ourſelves from evil, but to intereſt us in the defence or reſcue of the injured and helpleſs, and to raiſe us above the fear of the proud and mighty oppreſſor.

Neither, therefore, is all anger ſinful: hence the precept, "Be ye angry and ſin not."—It becomes ſinful, however, and contradicts the rule of ſcripture, when it is conceived upon ſlight and inadequate provocations, and when it continues long. It is then contrary to the amiable ſpirit of charity, which "ſuffereth long, and is not eaſily provoked." Hence theſe other precepts, "Let every man be ſlow to anger;" and, "Let not the ſun go down upon your wrath."

Theſe precepts, and all reaſoning indeed upon the ſubject, ſuppoſe the paſſion of anger to be within our power: and this power conſiſts not ſo much in any faculty we have of appeaſing our wrath at the time (for we are paſſive under the ſmart which an injury or affront occaſions, and all we can then do is to prevent its breaking out into action), as in ſo mollifying our

Anger.

minds by habits of juſt reflection, as to be leſs irritated by impreſſions of injury, and to be ſooner pacified.

As reflections proper for this purpoſe, and which may be called the *ſedatives* of anger, the following are ſuggeſted by Archdeacon Paley in his excellent treatiſe of *Moral and Political Philoſophy** —" The poſſibility of miſtaking the motives from which the conduct that offends us proceeded; how often *our* offences have been the effect of inadvertency, when they were miſtaken for malice; the inducement which prompted our adverſary to act as he did, and how powerfully the ſame inducement has, at one time or other, operated upon ourſelves; that he is ſuffering perhaps under a contrition, which he is aſhamed, or wants opportunity, to confeſs; and how ungenerous it is to triumph by coldneſs or inſult over a ſpirit already humbled in ſecret; that the returns of kindneſs are ſweet, and that there is neither honour nor virtue nor uſe in reſiſting them—for ſome perſons think themſelves bound to cheriſh and keep alive their indignation, when they find it dying away of itſelf. We may remember that others have their paſſions, their prejudices, their favourite aims, their fears, their cautions, their intereſts, their ſudden impulſes, their varieties of apprehenſion, as well as we: we may recollect what hath ſometimes paſſed in our own minds, when we have got on the wrong ſide of a quarrel, and imagine the ſame to be paſſing in our adverſary's mind now; when we became ſenſible of our miſbehaviour, what palliations we perceived in it, and expected others to perceive; how we were affected by the kindneſs, and felt the ſuperiority, of a generous reception and ready forgiveneſs; how perſecution revived our ſpirits with our enmity, and ſeemed to juſtify the conduct in ourſelves which we before blamed. Add to this, the indecency of extravagant anger; how it renders us, whilſt it laſts, the ſcorn and ſport of all about us, of which it leaves us, when it ceaſes, ſenſible and aſhamed; the inconveniences and irretrievable miſconduct into which our iraſcibility has ſometimes betrayed us; the friendſhips it has loſt us; the diſtreſſes and embarraſſments in which we have been involved by it, and the ſore repentance which on one account or other it always coſts us.

* Book III. [Par]t ii. [Cha]p. 7.

" But the reflection calculated above all others to allay that haughtineſs of temper which is ever finding out provocations, and which renders anger ſo impetuous, is that which the goſpel propoſes; namely, that we ourſelves are, or ſhortly ſhall be, ſuppliants for mercy and pardon at the judgment-ſeat of God. Imagine our ſecret ſins all diſcloſed and brought to light; imagine us thus humbled and expoſed; trembling under the hand of God; caſting ourſelves on his compaſſion; crying out for mercy—imagine ſuch a creature to talk of ſatisfaction and revenge, refuſing to be intreated, diſdaining to forgive, extreme to mark and to reſent what is done amiſs: imagine, I ſay, this; and you can hardly feign to yourſelf an inſtance of more impious and unnatural arrogance."

Phyſicians and naturaliſts afford inſtances of very extraordinary effects of this paſſion. Borrichius cured a woman of an inveterate tertian ague, which had baffled the art of phyſic, by putting the patient in a furious fit of anger. Valeriola made uſe of the ſame means, with the like ſucceſs, in a quartan ague. The ſame paſſion has been equally ſalutary to paralytic, gouty, and even dumb perſons; to which laſt it has ſometimes given the uſe of ſpeech. Etmuller gives divers inſtances of very ſingular cures wrought by anger; among others, he mentions a perſon laid up in the gout, who, being provoked by his phyſician, flew upon him, and was cured. It is true, the remedy is ſomewhat dangerous in the application, when a patient does not know how to uſe it with moderation. We meet with ſeveral inſtances of princes to whom it has proved mortal; *e. g.* Valentinian the firſt, Wenceſlas, Matthius Corvinus king of Hungary, and others. There are alſo inſtances wherein it has produced the epilepſy, jaundice, choleramorbus, diarrhœa, &c. In fact, this paſſion is of ſuch a nature, that it quickly throws the whole nervous ſyſtem into preternatural commotions, by a violent ſtricture of the nervous and muſcular parts; and ſurpriſingly augments not only the ſyſtole of the heart and of its contiguous veſſels, but alſo the tone of the fibrous parts in the whole body. It is alſo certain, that this paſſion, by the ſpaſmodic ſtricture it produces in the parts, exerts its power principally on the ſtomach and inteſtines, which are highly nervous and membranous parts; whence the ſymptoms are more dangerous, in proportion to the greater conſent of the ſtomach and inteſtines, with the other nervous parts, and almoſt with the whole body.—The unhappy influence of anger likewiſe, on the biliary and hepatic ducts, is very ſurpriſing; ſince by an intenſe conſtriction of theſe, the liver is not only rendered ſcirrhous, but ſtones alſo are often generated in the gall-bladder and biliary ducts: theſe accidents have ſcarcely any other origin than an obſtruction of the free motion and efflux of the bile, by means of this violent ſtricture. From ſuch a ſtricture of theſe ducts likewiſe proceeds the jaundice, which in proceſs of time lays a foundation for calculous concretions in the gall-bladder. Laſtly, by increaſing the motion of the fluid, or the ſpaſms of the fibrous parts, by means of anger, a larger quantity of blood is propelled with an impetus to certain parts; whence it happens that they are too much diſtended, and the orifices of the veins diſtributed there opened. It is evident from experience, that anger has a great tendency to excite enormous hæmorrhagies, either from the noſe, the aperture of the pulmonary artery, the veins of the anus; or in women, from the uterus, eſpecially in thoſe previouſly accuſtomed and diſpoſed to ſuch evacuations.

END OF THE FIRST VOLUME.

ERRORS. CORRECTED.

Page.	col.	line.	Errors	Corrected
5	2	63	" him"	" to him."
—	—	*penult.*	" to nor"	" nor."
11	1	55	" Bodelian"	" Bodleian."
—	2	25	" Maiemen"	" Maimon."
136	2	39	" burrow"	" barrow."
208	2	54	" fig. 3."	" fig. 6."
247	2	19	" principle"	" principal."
337	2	52	" ufe to be formerly fet"	" fhould be firmly fet."
561	2	*penult.*	" our interpreter"	" the interpreter."
646	1	28	" took place. The"	" took place, the"
752	2	*marg.*	" Venerum"	" Venarum."

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